INDUSTRIAL STRUCTURE OF NEW ENGLAND

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INDUSTRIAL STRUCTURE OF NEW ENGLAND

BY
CHARLES E. ARTMAN

PART I OF THE COMMERCIAL SURVEY
OF NEW ENGLAND

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FOREWORD

Rapid changes taking place in American commerce and industry make it especially timely to marshal and analyze pertinent facts bearing upon the economic life of the Nation. To this end commercial and industrial surveys of different sections of the United States have been undertaken by the Department of Commerce with a view to reducing waste in industry and in the distribution of goods. New England is the second region to be surveyed under this program, the first survey having dealt with the Southeastern States. The three volumes devoted to this New England study give a complete economic analysis of the region, dealing with the various phases of its industries, commerce, and marketing.

This volume presents the productive activities and resources of New England. The greater portion is devoted to a detailed analysis of its manufactures; but agriculture, forestry, fisheries, transportation, power, fuel, population, and building and construction are each given full consideration. The report shows the general condition of New England's industrial life, its trend in recent years, and its place in national affairs.

Much of the information presented here was obtained prior to 1927, at a time when some phases of New England industries were at low ebb. It should be borne in mind that this region has made substantial advances since that time in adjusting itself to national and world changes, and it has recovered in large measure from the depression that followed the sharp readjustment in some of its basic industries. The favorable factors are dominant. New England industries as a whole are on a sound basis, and the outlook for the future is generally one of confidence.

It is manifestly impossible to deal here with every phase of New England industrial life. If time and space permitted, it would be highly desirable to show the important part played by New England investments, both within and without these States, and to discuss the insurance activities which bring a large revenue to the region. Early investments now widely distributed throughout the Nation provide a substantial income to the people of New England. A great industrial asset exists in its supply of skilled workmen and factory operatives. With long experience in business management and in labor organization, New England appears to be increasing harmonious relationships between labor and management. Its highly developed civic, educational, and social institutions, and the family ties strengthened by several generations of life in this section are also powerful influences that react favorably upon the whole population.

The discussion of productive activities and resources in this volume is supplemented by an analysis of New England as a consuming market in Volume II, Commercial Structure of New England, and in Volume III, Market Data Handbook of New England, with maps and statistics of the various marketing areas of the region. These three volumes give New England, for the first time, a common body of authentic facts about its agricultural, industrial, and commercial development, and provide probably the most comprehensive study of the economic structure of New England yet undertaken.

The New England Council was largely instrumental in undertaking this survey and made a substantial appropriation of funds to assist the Department of Commerce in obtaining the facts regarding New England industry. The survey was carried out with the cooperation of many manufacturers, business men, public officials, local chambers of commerce, trade associations, and other agencies, whose helpful assistance is acknowledged.

The present volume is the specific work of Dr. Charles E. Artman, who has had general charge of the entire New England Survey. Assistance and criticism were given by various Government agencies. Credit for major contributions is given to individuals in the sections concerned.

William L. Cooper, *Director.*
Bureau of Foreign and Domestic Commerce.

November, 1929.

INDUSTRIAL STRUCTURE OF NEW ENGLAND

INTRODUCTION

Generalizations regarding New England industry can be fairly made only with full command of the facts underlying its economic structure. In this work emphasis is placed upon the presentation of facts in organized form, from which the reader may make his own interpretations and draw his own conclusions.

In this volume New England is considered primarily as a producing region. All available sources have been canvassed for facts regarding the resources and productive activities of the region. The important elements that form a background for New England's commercial and industrial development are its natural characteristics, including its location; its physical structure and climate; its native resources in soil, forests, minerals, and fisheries; and the number, types, and distribution of its population. These have determined the form and growth of its industry and the extent of its commerce. The topography and climate of the region have influenced the development of a rugged, enterprising, self-reliant population, and have given impetus to specific forms of industrial development.

The first portion of this volume deals with these background elements, giving separate analyses of New England agriculture, forest resources, mineral assets, and fisheries. The facilities by which New England is tied up with the rest of the United States through rail and water transportation are briefly presented. Because power and fuel supply play a vital part in the industrial life of this region, these subjects are treated in separate sections. A general analysis of the population is then presented in respect to (*a*) distribution throughout the area, (*b*) racial elements, (*c*) migrations within New England, and (*d*) trend of population growth.

Much space is given to a detailed presentation of the various manufacturing activities. An introductory section presents a general picture of the nature, importance, diversity, and trends in New England manufacturing as a whole, and its position in the industrial life of the Nation. Analysis is then made of each important line of manufacture. For this portion of the report an inquiry was directed to every manufacturing establishment in New England, requesting information as to (*a*) experience in methods of manufacture, (*b*) plant organization, and (*c*) marketing organization.

Upward of 5,000 New England manufacturers cooperated by supplying information concerning their experiences in the past few years of industrial adjustment. This information was carefully analyzed and digested. It is supplemented by an analysis of census data for the individual industries, and by other information from trade sources. Many months of effort were devoted to this work. The results presented here perhaps afford the most comprehensive survey of the industrial structure of a major area that has yet been made.

The information is presented in condensed and carefully organized form to give the reader the general facts about other fields as well as the one in which he is especially interested. The purpose of this work is to build up a fairly complete picture of New England industrial life as a whole, rather than to present a detailed story of each field.

New England is considered as a homogeneous economic unit because of its location and its relation to the rest of the country and because of the distinctive character of its economic life. This holds true generally for the six States, with the exception of a portion of southwestern Connecticut, which is adjacent to the New York metropolitan area. This region is also a convenient unit from historical and political standpoints. The six States comprising New England have many fundamental characteristics in common. As the birthplace of the factory system New England is the oldest industrial section of the United States. The industrial life of America is deeply rooted in New England soil. Up to the close of the Civil War this region was the Nation's main source of manufactured goods. It was the first region to reach the stage of industrial maturity where it possessed a surplus of capital available for the industrial development of newer regions. These regions, in turn, have become competitors in the markets for New England's products.

Because New England was the cradle of America's industrial development, most of the Nation's manufactures had their origin there and many processes and products of fundamental national importance were invented and developed in that section. It was the seat of early shipbuilding activity and the pivot of the Nation's sea commerce. For decades the textile industry was concentrated in New England mills, and its place in cotton manufacture was undisputed until recent years. As a producer of footwear New England has long held the place of national leadership. In the finer grades of metal manufacture, especially of machinery, precision tools, and silver, New England industry still ranks high. Despite a national expansion that has pushed forward the industrial development of other regions relatively faster than that of New England, these States still hold a commanding position in many products of manufacture.

The supremacy enjoyed by New England industries in the early years of national growth had its basis in the early application of factory methods to the production of articles for meeting the fundamental needs of the country's population. This expressed itself in its outstanding leadership in the manufacture of textiles and of footwear.

Since the day when these primary needs were uppermost in the manufacturing activity of the country, fundamental changes have taken place in the markets for manufactured goods. New standards of living within the reach of multitudes have changed the emphasis from provision for primary comforts to indulgence of a wide range of choices in which style, attractiveness, and personal appeal are determining factors rather than durability and basic quality. The era in which people spent most of their incomes to satisfy the primary needs of life has given way to a new era in which expenditures are largely for articles of convenience and luxury. This is exemplified in the rise of great new industries which to-day hold a dominant place in American economic life, as expressed by the automobile, motion pictures, radio, and other marvelous facilities for travel and entertainment. These have all grown up since the establishment of the dominant New England industries. Revolutionary changes in distribution and marketing methods have also taken place in recent years.

The results of this survey point definitely to certain significant conclusions. In the last few years New England has been passing through a period of drastic adjustment, which has been accompanied by depression in some major lines; but a great deal of adaptation to new industrial conditions has already taken place. While certain industries, particularly cotton textiles, have been far from prosperous, the general industrial life of the region as a whole is sound and secure. Marked improvement is evidenced in the general condition of New England industry, particularly since 1927. The advance has been pronounced in textiles and shoes. Agriculture now holds a more important place and provides a greater real income to New England than it did 50 years ago—a triumph of selection, increased efficiency, and specialization. The region still possesses substantial wealth in its forests, its stone industries, and its fisheries. Underlying these material resources New England has great assets in the skill and technique of its workmen; in its experience in industrial organization and management; and in its reserves of accumulated capital and equipment.

Part I.—NATURAL CHARACTERISTICS AND RESOURCES

PHYSICAL BACKGROUND

New England forms a part of the great industrial region of the northeastern United States, whose boundaries are outlined roughly by the Potomac, Ohio, and Mississippi Rivers, with the Atlantic Ocean on the east and Canada on the north. Since the greater part of the population, wealth, industry, and commerce of the United States is concentrated in this northeastern quarter of its area, the location of New England in the extreme northeast, fronting on the Atlantic Ocean, is much nearer and more accessible to the Nation's dominant activities than appears from casual observation of its place on the map. New England is not remote from the great mass of the country's population nor from the principal industrial areas, and for its coal and raw materials draws largely upon this northeastern region, while its advantages of water transportation give it favorable access to other sources.

From the geographic center of New England to the center of the Nation's land area in central Kansas the air-line distance exceeds 1,500 miles. Between New England's center of population and that of the country as a whole in western Indiana the distance is only a little more than half as great, being 850 miles. From New England's center of manufacturing activity in eastern Massachusetts to the Nation's manufacturing center in northwestern Ohio the distance is shortened to 650 miles—considerably less than half the distance between their respective geographic centers. In relation to the Nation's population and industry New England thus occupies a distinctly favorable position.

Within a radius of 300 miles from Boston, the metropolis of New England, are included New York, Philadelphia, and Montreal. Such a radius embraces more than one-fifth (22 per cent) of the population of the United States and a considerable portion of the population of Canada. A circle of 500 miles radius includes Buffalo, Pittsburgh, Baltimore, Washington, and Norfolk, and embraces almost one-third (31 per cent) of the Nation's population. When the circle is extended to a radius of 850 miles, it takes in also Cleveland, Chicago, Milwaukee, Indianapolis, Louisville, Knoxville, and Charleston, and includes more than half the population of the United States. Within a radius of 1,100 miles from Boston dwell about two-thirds of the population of the whole country.

The air-line distances and the shortest rail distances from Boston to important commercial centers of the eastern United States are as follows:

Distance From Boston to Important Commercial Centers

City	Air-line distance	Rail distance	City	Air-line distance	Rail distance
	Miles	*Miles*		*Miles*	*Miles*
New York	188	235	Chicago	849	1,034
Philadelphia	268	326	Atlanta	933	1,111
Baltimore	358	423	St. Louis	1,036	1,230
Pittsburgh	478	679	New Orleans	1,359	1,607
Cleveland	550	682			

BOUNDARIES AND AREA

Fronting to the east and south on the Atlantic Ocean and Long Island Sound, and having the Canadian Provinces of Quebec and New Brunswick for its northern and eastern boundaries, New England has direct land connection with the rest of the United States only where its adjoins New York State on its western border. Here the waters of Lake Champlain interpose for one-third of the distance. For a portion of the distance also the Berkshire Hills of western Massachusetts interpose a physical barrier to easy communication with the West, and the broad Hudson River limits direct rail access to only a few points. Rail entry to New England by natural passageways over its western boundary is restricted to three narrow corridors. One of these is along Long Island Sound at the southern extremity of Connecticut; another is at the northern end of the Hudson River Valley around the upper end of the Berkshires; and the third is at the extreme northern end of Vermont across the foot of Lake Champlain.

New England occupies only 2 per cent of the land surface of the United States. Its six States considered collectively would rank twentieth in size among the States of the entire country. The total area of New England is about equal to that of New York and half of Pennsylvania; it is about the same as Missouri or Washington, and is slightly larger than Florida; it is about one-half the size of California, and is only one-fourth as large as Texas.

From the tip of northern Maine to the southernmost point of Connecticut the maximum diagonal length is about 475 miles. The extreme width east and west is about 320 miles. The State of Maine occupies about one-half the total area of New England. It is somewhat surprising to learn that the geographical center of New England is in Maine, about 40 miles northwest of Portland. From Portland to the northern tip of Maine the distance is greater than from Portland to New York City.

About four-fifths of the New England population lives in its three southern States, which comprise less than one-fourth of its total area. The size of these three States can be visualized by the fact that their whole extent is included within a rectangle 200 miles east and west by 135 north and south.

The high concentration of population and manufacturing in southern New England is indicated by the fact that its center of industrial activity is in eastern Massachusetts, near Framingham, within 20 miles of Boston, and its center of population is near Ayer, about 30 miles northwest of Boston.

TOPOGRAPHY

The contour map,[1] which faces page 1, indicates the great variety of surface features. The limited belts of green show the low portions along the coast and in the river valleys. The mountains and higher elevations are shown in red and brown. The other colors show intervening levels.

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[1] As this map is considerably enlarged from a generalized contour map made several years ago, it contains a few slight inaccuracies, which, however, do not detract from its usefulness in showing comparative elevations in New England.

A study of this map shows that the low-lying shore regions below an elevation of 100 feet are generally very narrow. These are limited to a narrow fringe along the shores of southern Maine, eastern Massachusetts, Rhode Island, Connecticut, and the valley of the Connecticut River. Included in these low areas is the sandy projection of eastern Massachusetts that forms Cape Cod, together with the adjacent islands of Nantucket and Marthas Vineyard. This narrow strip of low coast in New England is quite in contrast to the wide coastal plain farther south, extending from New Jersey to Florida.

Back of the low coastal regions the interior of New England rises to highlands ranging in elevation from 500 feet to mountainous ridges rising above 3,000 feet in some places. Approximately one-half of New England exceeds 1,000 feet in elevation. These higher areas include most of Massachusetts west of the Connecticut River Valley and a small portion of north-central Massachusetts; they reach downward also into northwestern Connecticut and extend northward to include most of southern and central Vermont, as well as the western and northern portions of New Hampshire and the northwestern section of Maine.

What may be termed the physical backbone of New England is the mountainous portion which stretches from the Canadian border in Maine to the White Mountains in New Hampshire and the Green Mountains in Vermont, reaching thence to the Berkshires, in Massachusetts and northern Connecticut. The northern and western portions are conspicuously rough and rocky, with outcropping ledges interspersed with numerous water courses and lakes. The southern and eastern portions form an upland generally sloping east and south from the mountain areas to the Atlantic.

The ruggedness of its surface has been an important factor in the development of New England. The topography has made possible water power, has influenced the routes of roads and railroads, and has limited the development of agriculture. The mountains and lakes have made New England known as a vacation land in summer and a place for winter sports.

RIVERS AND WATERFALLS

The rivers of New England, rising in the highlands of the interior, flow generally southward to the sea. Exceptions to this are the Charles River, which flows eastward into Boston Bay; the lower Merrimack, which after reaching the Massachusetts line flows eastward; and the upper St. John River, in northern Maine, which flows northeast to the national boundary and thence eastward into New Brunswick.

Because of the frequent and abrupt changes in elevation, many of the streams make sharp descents at numerous places, forming waterfalls where they pass over rocky ledges. These waterfalls are in many instances the result of movements of glacial ice which blocked the old channels of streams and forced them into new courses across rocky formations. Where the resulting waterfalls occurred near the coast they became an important factor as a source of power and thus determined the early industrial growth. This is illustrated by such early industrial centers as Biddeford, on the Saco River in

Maine; by Lowell, Lawrence, and Haverhill, on the Merrimack; and by Pawtucket, on the Blackstone River in Rhode Island.

From the standpoint of drainage and power the more important rivers of New England are the Connecticut, the Housatonic, and the Thames, which flow into Long Island Sound; the Blackstone River, flowing into Narragansett Bay; the Taunton River, in southeastern Massachusetts; and the Charles and the Merrimack, in eastern Massachusetts and New Hampshire. In Maine the important rivers are the Saco, the Androscoggin, the Kennebec, and the Penobscot, flowing into the Atlantic; also the Aroostook and the St. John, in northern Maine, which flow through Canadian territory. Although the northern portion is much more abundantly supplied with water power, the streams of southern New England have been much more fully developed.

While the navigation afforded by these rivers is of little present importance to the interior, it was a substantial factor in the early growth of cities near the coast, giving them access to tidewater transportation. In the early days of smaller boats and of greater dependence upon water traffic, navigation of the coastal streams extended considerably farther inland. Water-borne traffic now moves on the Connecticut River as far as Hartford; on the Thames, to Norwich; on the Charles, to Cambridge; on the Merrimack, to Haverhill; on the Kennebec, as far as Augusta; and on the Penobscot, to Bangor. The principal importance of these streams in water traffic is now for transporting coal and other bulky materials, such as stone, sand, gravel, and lumber.

COAST LINE AND HARBORS

The excellent natural harbors provided by the numerous indentations of the New England coast were in the days of the sailing vessel the foci of its important sea commerce. These natural harbors influenced the location and development of the region's industries by favoring the accumulation, at these points, of wealth from extensive sea ventures. These harbors gave preeminence to New England on the American coast in the same way as the contact of Great Britain with the sea enabled her to build up a far-reaching maritime trade. The advantage of its maritime position goes far to explain why more than three-fourths of the present population of New England lives within 50 miles of tidewater.

With a total shore line of approximately 2,000 miles, fronting upon the rich fishing banks of the North Atlantic, the situation was favorable for fishing as well as commerce. The shores of New England provided a great stage for these enterprises. It was thus no accident that the people of this region made their first great economic successes in fishing, whaling, and ocean trade.

New England's favorable position on the sea, which enabled it to build up a large sea commerce in early days, was thus a determining factor in locating its centers of industrial development, because this development had its start in the wealth and capital accumulated from sea activities. At a later period the great mill sections were determined by the water power of New England rivers and streams. When water-driven machinery was supplanted by steam the position of advantage in manufacturing was again shifted to points on or near the coast, where coal could be transported cheaply by tidewater. Thus the topography of New England and its frontage on the sea have continuously determined and modified the location of its industrial activities.

CLIMATE

The climate of New England is characterized by frequent weather changes, long and cold winters, usually with considerable snowfall, comparatively short summers with occasional brief periods of high temperature, and usually very delightful fall weather. Periods of extreme heat last but a few days, and on the coast they are modified by sea breezes. The average number of days with oppressive humidity or with dense fog on the coast is small.

Lacking the enervating heat and humidity of more southern regions, the year-round New England climate is stimulating to exertion, conducive to health and vitality, and favorable to industrial enterprise. Although winters in the northern and interior portions are rigorous, they are not too severe for human comfort; in the southern portion they are moderate. The mean annual temperature in southern New England ranges between 47° and 49° F.; in most of the northern portions it ranges from 41° to 42° F., falling in the extreme north to 39°.

The invigorating climate has played an important rôle in the industrial development of New England. Its general healthfulness fosters a sturdy, rugged population, and its variability is a stimulus to human activity. Its temperateness in the summer gives ideal living conditions.

The heavy snowfalls and the severe winter weather in the northern portions of New England are factors to be considered because of their retarding influence on traffic and communication. Winter weather, however, is not a serious hindrance to rail or highway traffic in the more densely populated sections of New England, and it does not hamper the activity of the ocean ports.

SIGNIFICANCE TO INDUSTRIES

Because this region lacks the enervating hot periods of some other sections, labor is maintained at full productivity throughout the year. Time is seldom lost on account of hot weather. The bracing air of New England generates ambition among the industrial population and promotes a sanguine attitude. The humidity of the coast regions is a distinct asset in certain industries, especially in the manufacture of textiles, where the moist air prevents the generation of static electricity and maintains the fibers in a pliable condition for spinning and weaving. In this respect the New England coast has advantages similar to those of the regions of old England, where the textile industry has had its fullest development.

Climate is an important factor in New England's most characteristic product—maple sugar and sirup. A favorable combination of climate and soil gives preeminence to cranberry culture, to the growing of blueberries, and to tobacco growing in the Connecticut River Valley. In the growing of low-temperature crops also, such as potatoes in northern New England and turnips in eastern Massachusetts, climate is a determining factor. It has given Maine sweet corn a wide reputation for fine quality. The New England climate and the air drainage in its valleys favor the production of apples of high quality.

The growing season in the southern part of New England varies from 150 to 170 days, and in the northern portion from 120 to 130 days. Along the coast the frost-free period is considerably longer than in the interior. In the northern part of Maine the growing season is shortened considerably by late spring frosts and early frosts in the fall; the frost-free period averages about 105 days. In southern New England the last killing frost of spring comes the latter part of April or early in May; and killing frosts in the fall occur from October 10 to October 20. In northern New England the danger from spring frosts is extended two weeks later, and killing frosts in the fall come in the latter part of September.

ANNUAL PRECIPITATION

New England is well watered throughout the year. The annual precipitation from rain and snow in the three southern States ranges from 44 to 46 inches. It is somewhat less than this in Vermont and New Hampshire, where it ranges from 35 to 40 inches. In Maine it ranges from 40 inches or less in the north up to 46 inches in other portions of the State.

Moderate showers and occasional thunderstorms provide most of the summer precipitation. Frequency of rainfall throughout the growing season generally assures good pasturage and the maturity of crops. Hailstorms are of rare occurrence, but they occasionally cause some damage to tobacco in the Connecticut Valley. In northern New England rainfall in the spring and fall comes mostly from storms that pass over the St. Lawrence Valley or up the coast. These storms sometimes continue for 24 or 36 hours, with a moderate or heavy fall of rain.

In southern New England precipitation is well distributed throughout the year, but in the north there is somewhat less in winter and spring than during the rest of the year. In the interior and northern portions, where most of the winter precipitation is in the form of snow, the accumulation often reaches a depth of several feet. In these sections the ground is generally well covered from early November to March or early April. The annual snowfall varies from 30 to 40 inches along the southern coast region to 70 inches along the coast of Maine, and even to 100 inches in the northern portions of New England. The atmosphere naturally has a greater moisture content along the coast than in the interior of New England. The average number of days with dense fog or oppressive humidity, however, is small. Foggy weather along the Maine coast is most common in the summer months, but there are few days of dense fog lasting for more than an hour except in the extreme eastern part. At Eastport, where there is more foggy weather than on any other portion of the Maine coast, the average number of days of fog during the summer months is 6 days in May and September, 7 days in June, 12 days in July, and 11 days in August.

RECREATIONAL ADVANTAGES

The wonderful variety of mountain and valley, of forest, lake, and open country, of picturesque shore line and river courses in New England is enhanced by the changing seasons. The seclusion of forest, lake, and stream, the grandeur of rugged mountain peaks, and the ever-changing shore line where the breakers roll in from the Atlantic, form an endless variety which makes New England the great recreational region of the eastern United States. With the congestion of population in American cities and the extension of facilities for motor transportation to the general public, these recreational advantages are becoming more and more recognized as a distinct commercial asset of New England. Each summer its population is swelled by increasing thousands of visitors from outside sections. In many localities the summer population is double or triple that of the winter season. Every year some of these visitors from other sections take up permanent summer homes in the region, and some become established in business or manufacturing, as permanent residents.

The importance of these recreational advantages is indicated by the existence of nearly 500 private summer camps, which each year are filled with boys and girls from all parts of the East. There are nearly 400 golf courses in New England. Many a hunter is attracted by the presence of game in the northern forests, and the fishing in its streams and lakes lures other pleasure seekers. Carnivals of winter sports are held at a dozen places. Along the coast summer communities are populated each year by visitors to Narragansett Bay, Buzzards Bay, Nantucket, Marthas Vineyard, Cape Cod, the North Shore, and hundreds of places along the coast of Maine.

The diversity of its mountain scenery, the beauty of its lakes and valleys, the fascinating spell of the seashore, the historic associations of New England villages, and landscapes enriched by three centuries of American history, are attractions of New England which draw increasing thousands of visitors to its borders each year. These, with well-kept highways, the provision of comforts for year-round outdoor life, and the charm and beauty of the countryside, have made New England widely known as a year-round playground.

AGRICULTURE

NOTE.—The material presented in the section on agriculture is based partly upon information gathered by Dr. R. J. McFall, of the Bureau of the Census, while professor of agricultural economics at the Massachusetts Agricultural College.

Agriculture in New England is overshadowed by the region's manufacturing activities, yet the industries of the soil are of substantial importance. Concentration of a large food-consuming population in its industrial centers gives emphasis to the importance of food production far beyond the relative proportion of persons or acreage engaged. The further New England agriculture can go in supplying the needs of its own population, the more it reduces the necessity of spending the income of the region for food produced in other sections. An important advantage enjoyed by New England agriculture is the existence of a large consuming population near at hand, which provides a ready market for its products almost at the producer's farm.

In addition to its contribution to the food supplies of the region, New England agriculture provides an important consuming market for feeds and fertilizer and for farm implements and equipment. Besides this is the market afforded by the farm population for ordinary articles of human consumption. Maintenance of the prosperity of New England agriculture assures an important market for the varied products of the manufactured articles of this and other regions.

Products of New England agriculture in 1925 exceeded in value the contribution of net revenue from any single manufacturing industry of the region except cotton goods. Estimating the value of all farm production, including crops and animal products, on the basis of average yield and farm prices, the United States Department of Agriculture computed the value of the products of New England soil to be about $473,000,000 in 1925 and $476,000,000 in 1926. Animal products form a high proportion in these totals, representing more than 40 per cent of the value, while the value of all crops was less than 60 per cent.

Farm property in the six New England States was reported as having in 1925 a total value of $1,091,545,000, with a farm population of 657,755, living on 159,489 farms. The value of New England farm property as reported for that year was about two-thirds that of New York State or half that of Wisconsin. The New England farm population was about 125,000 more than that of California, 110,000 less than that of New York State, and two-thirds the farm population of Iowa.

The agriculture of New England is characterized by the production of articles mainly for consumption in near-by cities. It is thus governed by local market considerations and requirements rather than by the factors which determine the production in other agricultural regions of staple commodities for distant markets. A distinguishing characteristic of New England agriculture is the diversity of its production.

SPECIALIZATION

Dairying is the most extensive agricultural activity throughout this region, directed to the production of fresh milk and cream for consumption in the New England market. This line of production engages more farmers than any other. Aside from dairying, the source of greatest money income to New England farmers is the production of potatoes. This activity is concentrated largely in a single specialized region of northeastern Maine where a favorable combination of soil and climate makes the section one of the great potato-producing areas of the United States.

Apple growing is a specialized industry of considerable commercial importance in several districts in the three northern States of New England and in Massachusetts. Maple products are also a source of substantial income on the northern farms of these States, particularly in Vermont. In the valley of the Connecticut River tobacco growing and the production of onions are important sources of income. Cranberries are an important source of revenue to the growers in the Cape Cod region of southeastern Massachusetts. The highland region of southeastern Maine, especially Washington County, derives a substantial income from the blueberries which grow abundantly on the rugged uncultivated land of that section. Sweet corn for canning also contributes considerable amounts to the revenue of farmers in southern Maine.

Distributed about southern New England are various areas near the large cities which yield important incomes from the production of market-garden crops. Part-time farming on small tracts has had significant development in the vicinity of the large industrial centers. Poultry raising is of commercial importance in southern New England and in southeastern New Hampshire and Maine.

In regions not given to crop specialization there is some general farming in which hay is an important crop. In northern New England many a farmer combines agriculture and dairying with forestry, supplementing the income from his dairy herd with sales from the farm woodlot, augmented often by maple products. Grain is grown to a limited extent throughout New England for farm consumption.

CHARACTER OF SOILS

In consequence of the glacial origin and of the rough and broken surface of New England, there is great diversity in types of soil, as well as in the elevation of farm lands. With the exception of a few specialized regions, such as the Aroostook Valley in northeastern Maine and the valley of the Connecticut River in Massachusetts and Connecticut, very little uniformity of soil types exists anywhere in the six States. Along the low coast line stretches a narrow belt of sand, which in Massachusetts reaches out into the sea to form Cape Cod and the near-by islands of Nantucket and Marthas Vineyard. These are the only vestiges of a coastal plain in New England.

Practically all the tillable soils are of ample depth, are usually well drained, and are not subject to washing. In the heavier types of soil sufficient moisture is retained for growing crops, even during rather long dry periods.

New England soils may be classified according to type, contour, and elevation in four distinct groups. These are, first, the mountainous and hilly regions of the higher elevations; second, the upland valleys interspersed among the hill regions; third, the more level land of the lower elevations; and, finally, the lowland valleys and coast region. The general localities where these various types prevail may be observed by reference to the colored topographical map facing page 1.

Among the mountainous and hilly regions there is generally a thin soil and such a prevalence of rock that tillage is not profitable under modern conditions. In early days much of this land, after clearing from the primitive forest, was given over to cropping in small, irregular fields, which yielded fairly good crops until the virgin fertility of the soil was exhausted. The difficulty of working this type of soil in competition with the richer land of the western farms is the principal reason for the abandonment of agriculture on much of this broken land, and for its consequent reversion to forest. Most of it is better adapted to timber growing than to farming, but portions of it are profitably utilized for farm pasturage as a support to the dairy industry.

On the floors of the numerous upland valleys lying among the hilly regions there is generally a rather light and fine type of soil which is easily worked and which warms up quickly in the spring. These upland valleys range from small, narrow hollows among the hills and along stream beds to quite extensive tracts of fairly level land. Apple orchards thrive in these upland valleys where the air drainage is good, and early specialty crops also grow well there. Near the large cities some of these valley soils are profitably utilized in the growing of market-garden crops.

The soils of the lower elevations are in areas of smoother contour, and are better suited to agriculture. Under proper care they provide excellent pasturage. They are mostly loams, varying from a gravelly or sandy texture to fine silt. In some sections they are favorably affected by the presence of chemicals in the bedrock, such as phosphate material in Aroostook County of Maine, and lime in Vermont, western Massachusetts, and Connecticut. Some of these soils are admirably adapted to the growth of the heavier vegetables, such as potatoes, and of hay, grain, and forage crops. In all but the northern portion of New England corn matures well on these soils of the lower elevations.

The coastal region of southeastern Massachusetts and areas back of it are dotted with marshes and beds of peat rich in accumulated vegetable matter, which are especially suited to cranberry growing. The moist atmosphere and even, cool temperature of the growing season in this district have combined to make it the principal cranberry producing area of the United States. The sandy soil at the base of Cape Cod is also peculiarly adapted to the growth of such crops as strawberries and asparagus.

IMPROVED FARM LAND

Less than a quarter of the total land surface of New England is now in farms, and only a little over one-third of this portion is classified as improved land used for producing crops and as plowable pasture. The improved crop and plowland is only 13.6 per cent of the total land area of New England, in comparison with 36.6 per cent for New York State, with 50.3 per cent for the East North Central States, and with 26.5 per cent for the United States as a whole.

In 1925 there were 15,858,000 acres in the farms of New England, out of its total land surface of some 68,000,000 acres. The improved farm land, embracing the portion that is cropped or in plowable pasture, comprised only 5,395,140 acres. The land now suitable for tillage in New England is but slightly more than 1 per cent of the tillable land area of the entire United States, and it is but 5 per cent of the tillable land in the 14 States east and north of the Mississippi and Ohio Rivers. It is less than half the acreage of improved land in the neighboring State of New York.

The relative importance of agriculture in the individual States of New England, as indicated by the proportion of workable farm land in the total area of the State, is shown by the following percentages: Vermont, 24; Connecticut, 20.7; Rhode Island, 16.1; Massachusetts, 15.1; New Hampshire, 10.9; and Maine, 9.7. The proportion of improved farm land in each county of these States is shown graphically in Figure 1.

REGIONAL PRODUCTION

The Census of Agriculture for 1925 gives for each county the yield and the value of the principal crops of the previous years, and of the principal livestock products. The crops include corn harvested or cut for silage, wheat, oats threshed, barley, buckwheat, dry beans, hay, tobacco, potatoes, strawberries, sweet corn, and apples. The livestock products include, as dairy products, the milk produced, butter made on farms, butterfat sold, and the value of whole milk sold in 1924; they include also the value of wool and of eggs produced and of chickens raised in 1924.

These agricultural products had an aggregate value in the six New England States in 1924 somewhat in excess of $246,000,000. In each of the States of Maine, Vermont, Massachusetts, and Connecticut the total value exceeded $50,000,000. In New Hampshire it was somewhat less than half this figure, while in Rhode Island it was nearly $7,700,000. The relative production of the individual counties in New England, as shown by the value of these products in 1925, is indicated in Figure 2.

It is recognized that these figures take only partial account of the specialized products which are of importance in certain sections of New England. Neither do they take account of the production on small tracts, not designated as farms, adjacent to villages and cities. In these latter places the production of vegetables, fruits, poultry, and dairy products, largely for home consumption, reaches a very considerable value. If the total figures for all products of agriculture and of livestock and poultry were obtainable by counties, the

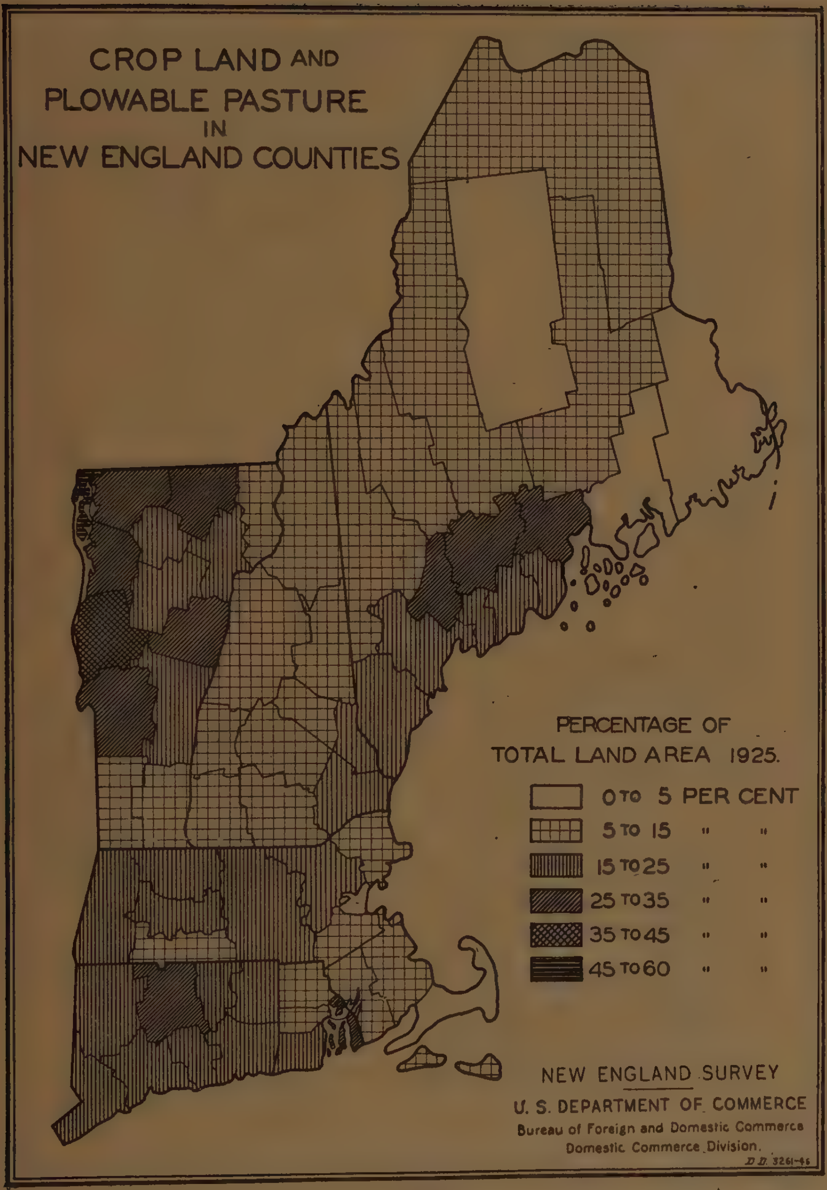
CROP LAND AND
PLOWABLE PASTURE
IN
NEW ENGLAND COUNTIES
PERCENTAGE OF
TOTAL LAND AREA 1925.
0 TO 5 PER CENT
5 TO 15 " "
15 TO 25 " "
25 TO 35 " "
35 TO 45 " "
45 TO 60 " "
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division.
D.D. 3261-46

Figure 1

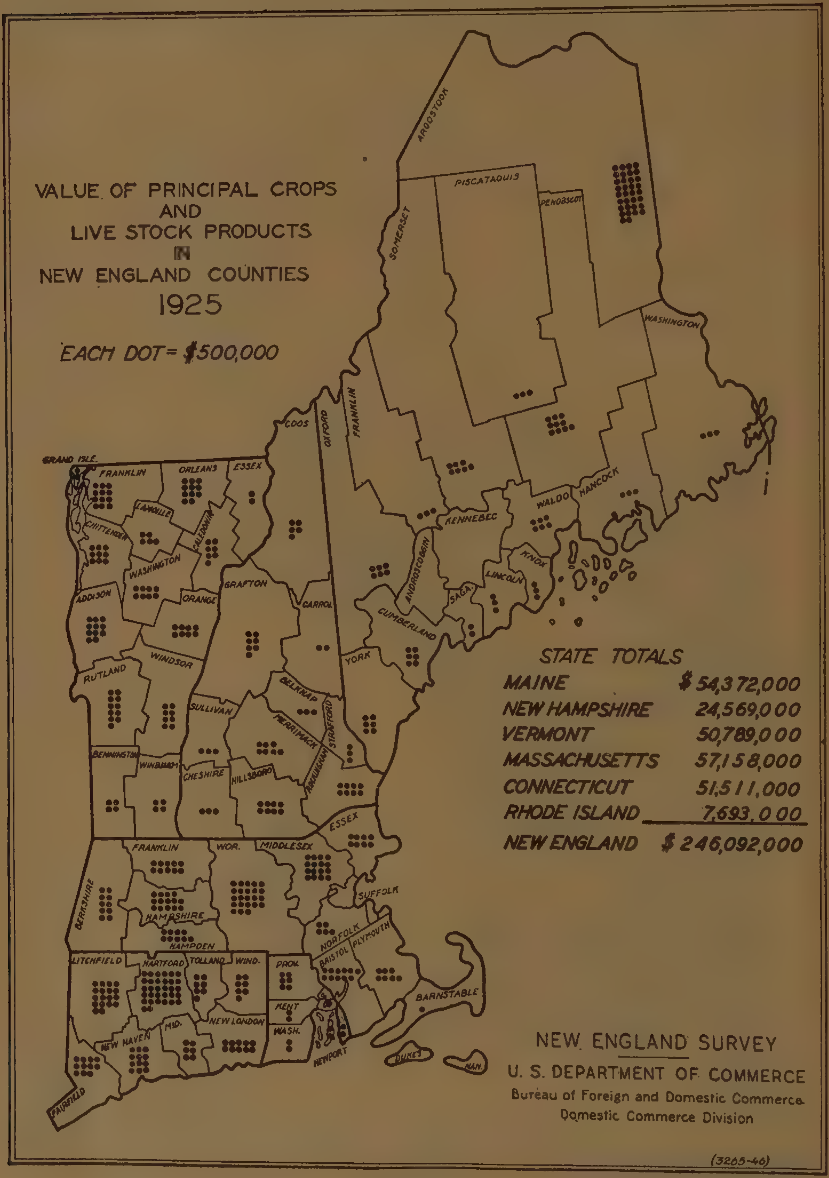
VALUE OF PRINCIPAL CROPS
AND
LIVE STOCK PRODUCTS
IN
NEW ENGLAND COUNTIES
1925
EACH DOT = $500,000
STATE TOTALS
MAINE $54,372,000
NEW HAMPSHIRE 24,569,000
VERMONT 50,789,000
MASSACHUSETTS 57,158,000
CONNECTICUT 51,511,000
RHODE ISLAND 7,693,000
NEW ENGLAND $246,092,000
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
KENNEBEC
ANDROSCOGGIN
WALDO
HANCOCK
KNOX
LINCOLN
SAGA.
CUMBERLAND
YORK
COOS
GRAFTON
CARROLL
BELKNAP
STRAFFORD
MERRIMACK
ROCKINGHAM
SULLIVAN
CHESHIRE
HILLSBORO
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ORANGE
ADDISON
WINDSOR
RUTLAND
BENNINGTON
WINDHAM
ESSEX
FRANKLIN
WOR.
MIDDLESEX
BERKSHIRE
HAMPSHIRE
HAMPDEN
SUFFOLK
NORFOLK
BRISTOL
PLYMOUTH
BARNSTABLE
DUKES
NAN.
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
NEWPORT
NEW HAVEN
MID.
NEW LONDON
FAIRFIELD
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division
(3265-40)

Figure 2

total values would be increased considerably. The map (fig. 2) shows in a general way, however, the relative agricultural productiveness of the individual counties of New England.

CHANGES AND TRENDS

The period of maximum farm activity in New England, as indicated by the acreage, was about 1880. The census for that year gives the total land in farms as nearly 21,500,000 acres. The total reported for 1925 was 15,858,000 acres. The improved land in farms reported in 1880 was 13,148,000 acres, and by 1925 it had fallen to considerably less than half this amount—5,395,000 acres. In the same period the improved farm acreage in the United States nearly doubled. Changes in the individual States of New England in this 45-year interval, both in total land in farms and in improved land capable of cultivation, are shown in the following table.

Changes in New England Farm Acreage, 1880–1925

State	Total land in farms		Improved land in farms (crop and plowable pasture)	
	1880	1925	1880	1925
	Acres	*Acres*	*Acres*	*Acres*
Maine	6, 552, 578	5, 161, 428	3, 484, 908	1, 839, 283
Vermont	4, 882, 588	3, 925, 683	3, 286, 461	1, 401, 876
Massachusetts	3, 359, 079	2, 367, 629	2, 128, 311	772, 519
Connecticut	2, 453, 541	1, 832, 110	1, 642, 188	639, 341
New Hampshire	3, 721, 173	2, 262, 064	2, 308, 112	632, 519
Rhode Island	514, 813	309, 013	298, 486	109, 602
Total	21, 483, 772	15, 857, 927	13, 148, 466	5, 395, 140
United States	536, 081, 835	924, 319, 352	284, 771, 042	505, 027, 400

Changes accompanying the reduction in farm acreage, as regards the number of persons engaged in agriculture and the number of farms, together with total acreage and improved farm acreage, are indicated for the census intervals since 1850 for New England as a whole by the figures of the next table. This is followed by tables showing the increase in value of farm property and the decrease in farm animals and in production of grains in New England.

Changes in Basic Factors in New England Farming Activity, 1850–1925

Year	Persons engaged in agriculture	Number of farms	Total land in farms	Improved land in farms
			Acres	*Acres*
1925	[1] 657, 755	159, 489	15, 857, 927	[2] 5, 395, 140
1920	221, 162	156, 564	16, 990, 642	6, 114, 601
1910	280, 760	188, 802	19, 714, 931	7, 254, 904
1900	287, 469	191, 888	20, 548, 999	8, 134, 403
1890	304, 448	189, 961	19, 755, 584	10, 738, 930
1880	301, 815	207, 232	21, 483, 772	13, 148, 466
1870	314, 810	180, 649	19, 569, 863	11, 997, 540
1860	297, 294	183, 942	20, 110, 922	12, 215, 771
1850	([3])	167, 651	18, 367, 458	11, 150, 594

[1] Total farm population.

[2] Crop land and plowable pasture.

[3] No data.

INCREASE IN VALUE OF FARM PROPERTY IN NEW ENGLAND, 1850–1920

Year	All farm property	Average farm investment	Value of farm lands and buildings	Value of farm implements and machinery
1920	$1, 173, 019, 594	$7, 481	$917, 225, 584	$92, 387, 525
1910	867, 248, 457	4, 593	718, 544, 808	50, 798, 826
1900	639, 645, 900	3, 333	528, 267, 748	36, 551, 820
1890	585, 267, 817	3, 081	489, 570, 178	23, 783, 288
1880	671, 846, 058	3, 242	580, 681, 418	22. 096, 563
1870	566, 353, 952	3, 135	468, 133, 979	18, 042, 446
1860	560, 467, 417	3, 047	476, 303, 837	16, 468, 564
1850	435, 154, 325	2, 596	372, 348, 543	12, 937, 290

DECREASE IN ANIMALS ON NEW ENGLAND FARMS, 1850–1925

Year	Cattle 1 year and over	Sheep 1 year and over	Swine	Mature horses	Oxen	Total work animals
1925	987, 400	122, 257	194, 040	255, 234	(1)	255, 234
1920	1, 222, 963	191, 691	383, 752	292, 236	(1)	292, 236
1910	1, 168, 528	306, 443	396, 642	343, 826	(1)	343, 826
1900	1, 316, 544	563, 217	362, 199	365, 045	[2] 65, 485	365, 045
1890	1, 411, 852	936, 532	407, 590	368, 849	111, 461	480, 310
1880	1, 503, 452	1, 362, 234	362, 133	324, 066	137, 581	461, 647
1870	1, 358, 137	1, 450, 155	241, 000	259, 368	198, 742	458, 110
1860	1, 572, 776	1, 779, 670	326, 176	258, 992	267, 960	526, 952
1850	1, 469, 028	2, 257, 583	361, 481	212, 274	293, 285	505, 559

[1] Small number.

[2] Steers 2 years and over.

DECREASE IN PRODUCTION OF GRAINS IN NEW ENGLAND, 1850–1925

Year	Oats	Corn	Buckwheat	Barley	Wheat	Rye
	Bushels	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
1925	6, 023, 120	1, 815, 862	366, 160	198, 644	118, 670	40, 735
1920	7, 099, 721	5, 597, 723	456, 762	343, 641	544, 786	149, 392
1910	7, 350, 601	8, 238, 394	602, 715	428, 617	114, 998	230, 458
1900	7, 643, 175	7, 807, 920	807, 336	704, 957	166, 125	317, 964
1890	8, 960, 323	4, 596, 046	890, 428	871, 872	289, 124	403, 525
1880	8, 839, 681	8, 376, 308	1, 039, 343	697, 884	1, 227, 037	730, 215
1870	9, 169, 504	7, 347, 666	1, 189, 413	1, 075, 059	1, 000, 693	703, 379
1860	10, 895, 185	9, 164, 505	990, 812	1, 199, 119	1, 083, 193	1, 425, 851
1850	8, 101, 268	10, 175, 856	716, 044	414, 496	1, 090, 894	1, 570, 589

In the two generations that have passed since New England farms had their greatest acreage the type of rural activity in this section has undergone radical changes, both in methods of production and in nature of products. The changes, which have been necessary for survival, have on the whole resulted in substantial progress. While some branches of this industry had setbacks from the changed conditions, other branches have made substantial gains.

According to the best available estimates, the gross value of the products of New England farms is now more than four times the value reported for 1879. Even when allowances are made for changes in price levels and for the increased outlay by farmers for feed and fertilizer, the net productivity of New England agriculture at the present time appears to be between two and three times as great as it was 50 years ago. This increase in net production has come about mainly as the result of increased efficiency and of specialization and concentration of effort on favorable localities and soils which are best adapted to specific products.

The most important products to-day are potatoes, fruits, onions, market-garden crops, tobacco, cranberries, blueberries, maple products, and particularly milk and cream. As a consequence of this specialization the volume of production from New England agriculture has more than doubled, despite a great reduction in the number of farms, with about one-half the former acreage of improved farm land and with very few more dairy animals.

In value of crop per acre of cultivated soil, four of the New England States—Maine, Massachusetts, Connecticut, and Rhode Island—were surpassed in 1919 (the latest date for which comparative figures are available) by only four other States—New Jersey, North Carolina, South Carolina, and Arizona. As a dairy region the relative importance of New England is indicated in a value of livestock per acre of farm land amounting to $9.60, compared with an average of $8.38 per acre for the rest of the United States; while the value of animal products per acre in New England was $7.79, compared with $2.69 for the country as a whole. The New England average was exceeded only by that for the three Middle Atlantic States of New York, New Jersey, and Pennsylvania, which was $10.18 per acre; and this figure was surpassed by all three States of southern New England.

PROBLEMS OF NEW ENGLAND AGRICULTURE

New England agriculture shows unmistakable marks of competition for labor, arising from the inducements offered by near-by factories. The constant drain of the farm population to urban centers has made the provision of man power for the farms an acute problem. New England farmers find it difficult to compete with the factories, both in their scale of wages and in hours of labor. New England has also to face in its own markets keen competition from the agricultural products of other sections of the United States. The competition which was formerly felt from the agricultural West in the production of grain, beef, and wool has more recently entered the field of dairy products, poultry, and fruits. On the other hand, the increase in urban population resulting from the development of city industries provides excellent near-by markets for such products of New England farms as can be grown locally in successful competition with more distant areas.

Problems of production and organization are faced by New England agriculture, because of the small size of most of the farming units, resulting from the broken surface of the land and the high percentage of soil that can not be used productively. Consequently it is difficult to introduce the large-scale mechanical operations that are successful in regions more uniform in topography and soil. The lack of capital that accompanies the small unit operation also limits the outlay for farm machinery. Urban competition for labor, on the other hand, has forced New England agriculture to use the minimum of man power. The scattered farms and the resulting sparse population in many rural districts have also constituted a distinct handicap to organized efforts by farmers.

As an aid to the solution of New England's agricultural problems the improved transportation that has come in recent years with the automobile and improved highways has done much by removing the isolation of farm life and by encouraging organized efforts among the farmers. The extension of electric power and light in numerous farm communities of New England is also a factor in meeting the difficulties from labor shortage. Significant developments have taken place in numerous regions where families of immigrant stock have become established on the farms, providing thereby a labor supply for intensive agriculture.

Despite the drains on the New England farm population, the portion of the old stock that has remained on the farms, augmented by increasing numbers of farmers of recent European origin, has been able to maintain a substantial net growth in agricultural production.

Fuller utilization of different types of soil is now the subject of special studies in Connecticut and Vermont. Detailed farm surveys have been made in each State. The maintenance of standard grades of quality in marketing certain products, notably fruits and eggs, has made significant progress through the use of official labels.

THE DAIRY INDUSTRY

Commercial dairying in New England is generally carried on in conjunction with other types of farming whereby farm labor may be used to full advantage by distributing its cost over other productive activities. Comparison of the value of dairy products with the cost of feeds indicates that this industry by itself would not be profitably conducted at prevailing prices, except as one element in a combination of farm enterprises; and yet, the utilization of farm roughage and of working time that would be otherwise unproductive makes the combined farm activities modestly profitable, where no single activity could support itself. There are numerous instances of specialization, however, particularly near the industrial centers, where the whole effort is devoted to milk production, and where most of the feed is purchased, as well as the livestock for maintaining the dairy herd. The most frequent examples of this high specialization are in southern New England.

New England is important as a breeder of dairy animals and its sales of purebred Jerseys, Holsteins, Ayrshires, and Guernseys to other parts of the United States and to foreign countries are a source of considerable income.

MILK PRODUCTION

The value of the total milk production of New England in 1925 was estimated by the New England Crop Reporting Service at $108,217,000 and its volume at 468,103,000 gallons. The contribution of the individual States is shown in the following table. Upward of 57 per cent of the total quantity in 1925 was produced in the three northern States of Maine, New Hampshire, and Vermont; but the value of the remaining 43 per cent produced in the three southern States was more than half (52 per cent) of the total value, on account of higher prices in the southern region. It is observed that the leading State in volume of production is Vermont, followed next by Massachusetts; but the value of the Massachusetts product exceeded that of Vermont by more than $4,000,000. Connecticut produced nearly 4,000,000 gallons less than Maine, but the value of its product was nearly one-half greater than that of Maine.

MILK PRODUCTION IN NEW ENGLAND STATES IN 1925

State	Quantity in thousands of gallons	Value in thousands of dollars	State	Quantity in thousands of gallons	Value in thousands of dollars
Maine	80, 147	14, 937	Rhode Island	16, 521	4, 875
New Hampshire	50, 107	10, 464	Connecticut	76, 398	21, 271
Vermont	138, 542	26, 262			
Massachusetts	106, 388	30, 408	Total	468, 103	108, 217

In former years most of the milk produced in New England, particularly that in the northern States, was made into butter and cheese, at first on the farms and later in central creameries. With the extension of the city demand for fluid milk, sweet cream, and ice cream, a rapidly increasing proportion has been marketed in the fresh state. The year-round production for manufacture is now limited chiefly to sections with the poorest transportation facilities for marketing fluid milk. In other sections there is some manufacture of the surplus during seasons of greatest production; but the growing demand for sweet cream absorbs an increasing portion of the supply which is not marketed as fluid milk. Very little butter is now made on farms.

Of the total milk production it is estimated that less than 20 per cent goes into the manufacture of butter, and only slight volumes are used for condensed milk and for cheese-making, probably not more than 2 per cent together. The volume of locally produced milk consumed in the manufacture of ice cream is unknown, because large quantities of cream, sweet butter, and condensed and evaporated milk are shipped in for this purpose from outside sources. The major portion of the New England production is sold as fluid milk and is consumed in its fresh state.

The changes that have taken place in the production of milk in the individual States from 1889 to 1924, according to available census data, are shown in the following figures. This table shows that milk production has advanced in the midst of the industrial sections of southern New England just as truly as in the rural regions of the north.

MILK PRODUCTION IN THE NEW ENGLAND STATES, 1889–1924

[In thousands of gallons]

State	1889	1899	1909	1919	1924
Vermont	90, 712	142, 042	122, 919	122, 096	127, 957
Massachusetts	82, 572	105, 572	90, 438	76, 317	86, 575
Maine	57, 970	99, 586	69, 785	77, 677	71, 131
Connecticut	54, 414	68, 952	59, 829	54, 894	65, 699
New Hampshire	42, 633	60, 724	44, 461	42, 556	38, 206
Rhode Island	10, 611	12, 924	12, 178	12, 099	13, 504
Total	338, 912	489, 800	399, 610	385, 639	403, 072

DAIRYING REGIONS

Considerable concentration of the dairy industry exists in northwestern Vermont and in the upper Connecticut River Valley. Aside from these sections, dairying has had its greatest development in the three southern States of New England. The industry is relatively unimportant in northern Maine and New Hampshire, in the Cape Cod district of Massachusetts, and in southern Rhode Island. In the north the regional variations are largely the result of natural conditions, while in southern New England the development of dairying has been influenced largely by the proximity of good markets in the industrial sections.

Northwestern Vermont, with unusually good pasturage, has conditions of rainfall and soil that are more favorable to the production of feed for animals than those prevailing in the region east of the White Mountains. Dairying in southern New England is favored by the greater density of farm population, as well as by the proximity of good markets. The greatest development has been in the most densely populated farming sections, which as a rule are near the industrial centers. The dairy farms in this region were started generations ago, and good marketing conditions have favored their growth. Consequently milk production per acre and per farm is greater in Massachusetts and Connecticut than in northern New England.

Almost all the counties of the northern States produce more milk than can be consumed locally. Their surplus is shipped to Massachusetts, Rhode Island, and New York. Although Massachusetts is the second largest producing State in New England, its product does not meet its own requirements for fluid milk and cream, and it draws large supplies from the northern States, as well as from New York State, in addition to cream, at certain seasons, from States west of New York and from Canada. A small volume of milk also comes from Canada. Connecticut produces more fluid milk and cream throughout the year than the State requires. It makes considerable shipments to New York, Springfield, Boston, and Providence. The smaller cities of Massachusetts, and Providence, in Rhode Island, draw upon near-by farms in Massachusetts and Connecticut, as well as upon Vermont and Maine, to supplement local production.

Each consuming community generally gets its supplies of fluid milk from the nearest available source. The small centers depend mainly upon local supplies, while the larger cities draw a considerable proportion of their requirements from distant regions. For the metropolitan area of Boston milk comes mainly from northern New England. The smaller cities of Massachusetts, and Providence, in Rhode Island, obtain most of their supplies from local producers, but a portion comes from the north. The Springfield district in western Massachusetts draws its supplies from the Connecticut River Valley, reaching as far north as Brattleboro, in Vermont.

MARKETING DAIRY PRODUCTS

Although New England as a whole produces enough fluid milk and cream to meet its own requirements, in addition to supplies for ice cream, there is a considerable movement of fluid milk, as well as of cream, both into and out of the region. In seasons of surplus there is a regular interchange of milk and cream with outside sections. The result is a net inward movement annually of some 2,000,000 gallons of milk and 1,000,000 gallons of cream, which balances that portion of local production which is manufactured into butter.

Western Connecticut and southwestern Massachusetts ship milk regularly to New York City, and some communities in western Vermont also ship a portion there. Offsetting this movement, some of the border regions of New York State ship milk to Boston and to Springfield, and to some extent into western Connecticut. From the Province of Quebec, just north of Vermont, there has also been some seasonal movement, mainly of cream into Massachusetts. All the milk and cream shipped into New England is consumed in its fluid form, except small surpluses which are carried for safety margins and small supplies used for ice cream, confectionery, and baking. It is estimated that a total amounting to somewhat over 25,000,000 gallons of local milk is converted annually into cream or butter.

Most of the milk from northern New England is collected at country shipping stations or creameries, where it is weighed, tested, and cooled, and then shipped, mainly in special refrigerated milk cars. Most of the cream is shipped in the same manner. The milk from individual farms is transported to central stations by trucks running on regular routes along the main road, or by the producers' own conveyances. The large Boston milk dealers have their own country stations in the north, where they buy the total product of the producer, regardless of seasonal variations in quantity. A considerable number of local cooperative creameries in Vermont and a few private concerns sell a portion of their product to regular or to occasional buyers. These form a reserve source of supply in periods of shortage from the regular channels. Some of the chain-store organizations obtain their supplies from these sources.

New England farmers have for many years had their cooperative agencies to assist in the marketing of milk. Most of these are represented in the New England Milk Producers' Association. This association negotiates the price of milk with the large city dealers in Boston and in some of the smaller cities. The price established by this association, although influenced largely at times by operations of the smaller cooperative creameries, is the basic price to producers for most of New England outside Connecticut.

Cooperative creameries have existed in northern New England for many years. Within the last decade or so numerous organizations have been formed, particularly in Vermont, which are equipped to sell their product either as butter or cream. The majority of these are active in the fluid-milk market, and some of them have regularly established sales connections in southern New England cities.

The industrial portion of Connecticut is served by the Connecticut Milk Producers' Association. Very little milk enters Connecticut from other States. The market is in the hands of this association, which acts as a broker in the sale of milk for its members. Uniformity of production is maintained throughout the year by imposition of price penalties for excess or for shortage. It has done much to remove one of the great difficulties in the marketing of New England dairy products—that arising from seasonal irregularity of production.

The surplus production in the peak of the season is a disturbing element in most of the markets outside Connecticut. It is most pronounced on the farms of northern New England, particularly in the good pasture region near Lake Champlain, where the volume produced in early summer is several times the winter production. In certain sections, however, this situation has been overcome by placing emphasis upon winter dairying. Southern New England, particularly Connecticut, produces a more even supply than the northern section.

POULTRY AND LIVESTOCK

The total value of all livestock products in New England in 1925 was estimated by the Department of Agriculture at $203,000,000. Inasmuch as this estimate does not include production which enters directly into home consumption and is not marketed commercially, it is believed that figures for the total value, if complete, would be considerably more than this. The following statement gives the estimated valuation for 1925 of the different kinds of livestock and poultry, exclusive of dairy animals.

Poultry products:	
Eggs	$31, 500, 000
Chickens and fowls	20, 000, 000
Ducks, turkeys, and geese	10, 000, 000
Calves, steers, and other beef cattle	11, 000, 000
Hogs and pork	4, 156, 000
Sheep, lambs, and wool	729, 000
Horses	200, 000
Total	77, 585, 000

POULTRY AND EGGS

The value of New England poultry products is considerably more than one-half the value of dairy products, as reported by the Bureau of the Census. Egg and poultry production is of considerable commercial importance in the more densely populated country districts of southern New England, and in southern New Hampshire and Maine. Although egg production is generally emphasized more than meat, broilers are raised extensively in special commercial plants and on farms, particularly in eastern Massachusetts, Rhode Island, and New Hampshire. Small flocks of hens are maintained on most farms throughout New England. Although back-yard flocks are not so common in the towns of southern New England as they were a few years ago, they still hold a considerable place in the industry. It is believed that with the inclusion of these small-town flocks the numbers given in the agricultural census would be increased by about one-quarter.

Production of eggs on New England farms in 1925 was reported as upward of 56,500,000 dozen, valued at $31,500,000. Eggs are sold largely direct to the consumers or to local retailers. On account of the high proportion of sales direct to consumers, New England poultrymen are able to command a premium price for eggs, and to avoid the more expensive marketing processes of some other farm products.

Most of the eggs produced on New England farms are consumed in the smaller urban centers and in the country, as is evidenced by the fact that the Boston market, which in 1925 handled a volume equal to the total New England egg production, obtained less than 10 per cent of its supply from New England. A portion of the Connecticut product goes to New York City. In Connecticut there are egg cooperative associations which sell at wholesale the surplus products not absorbed by their local markets. A similar association was formerly operated in New Hampshire for the special wholesale market in Boston.

The following table showing egg production and number of hens on farms in the various census years from 1880 to 1925 indicates the changes in New England poultry activities. It appears that the number of hens and the egg production has about doubled during the 45-year period. Substantial falling off is noted in 1920, presumably on account of the scarcity and high cost of feed in the postwar period.

EGGS PRODUCED AND NUMBER OF HENS ON NEW ENGLAND FARMS, 1880–1925

Year	Eggs	Hens	Year	Eggs	Hens
	Dozen			*Dozen*	
1925	56, 589, 947	8, 138, 168	1900	50, 686, 580	6, 606, 246
1920	37, 631, 896	5, 803, 507	1890	35, 538, 234	6, 685, 066
1910	55, 078, 175	7, 708, 636	1880	26, 802, 766	4, 088, 743

The relative importance of the poultry industry in the different New England States, according to census data for the year 1925, is shown in the following table.

COMPARATIVE IMPORTANCE OF POULTRY INDUSTRY IN NEW ENGLAND STATES IN 1925

State	Chickens on farms Jan. 1		Eggs produced		Chickens raised	
	Number	Value	Dozen	Value	Number	Value
Massachusetts	2, 029, 819	$3, 611, 587	14, 324, 666	$7, 592, 071	3, 731, 769	$5, 261, 794
Connecticut	1, 698, 900	2, 565, 340	11, 774, 725	5, 887, 365	2, 670, 099	3, 417, 727
Maine	1, 900, 008	2, 470, 012	13, 612, 813	5, 717, 381	2, 837, 654	2, 922, 784
New Hampshire	1, 207, 034	1, 689, 847	8, 181, 291	33, 599, 769	2, 441, 812	2, 856, 921
Vermont	941, 014	1, 185, 677	6, 371, 751	2, 548, 699	1, 339, 275	1, 433, 023
Rhode Island	361, 393	610, 755	2, 274, 701	1, 205, 591	519, 211	726, 894

Duck raising has been developed on a commercial scale in eastern Massachusetts in a district south of Boston, centering in the town of Wrentham. About 400,000 ducks are said to be produced yearly. The large producers are organized in a cooperative association which markets a large portion of the production in the metropolitan market through one Boston dealer. A considerable portion is disposed of through direct sale, as duck dinners and as sandwich fillings at roadside stands near the farms. Aside from this commercial development in eastern Massachuhsetts, neither ducks nor geese are important on New England farms.

The raising of turkeys, which was once an extensive activity in Vermont and Rhode Island, is still carried on to some extent in Vermont and to a limited extent in all the States. No statistics are available as to the total production.

HOG AND PORK PRODUCTION

The production of pork is not of great importance in New England, because of the lack of feed resources. Hogs are raised to a limited extent on dairy farms of northern New England, to utilize the surplus skim milk, and are finished for market with grain feeds. In southern New England hogs are raised to some extent near the large urban centers, where they are fed refuse food collected from the cities, with a small amount of grain. A considerable portion is slaughtered for home consumption on the farm, thereby reducing the dependence of the farm population upon purchased meat. The total number of hogs reported on New England farms on January 1, 1925, was 177,406, distributed by States as follows: Maine, 54,435; New Hampshire, 15,928; Vermont, 43,864; Massachusetts, 57,821; Rhode Island, 4,175; and Connecticut, 1,183. These figures are probably considerably less than the totals for the summer crop.

SHEEP, LAMBS, AND WOOL

The 1925 Census of Agriculture gives a total of 178,712 sheep and lambs in the six New England States. Over one-half of these, 84,680 sheep and 17,021 lambs, were in the State of Maine; nearly one-third were in Vermont and New Hampshire, with 34,670 and 16,055 sheep, and 7,144 and 3,464 lambs, respectively; Massachusetts had 10,114 sheep and 2,556 lambs; Connecticut, 604 sheep and 126 lambs; and Rhode Island, 1,897 sheep and 381 lambs. Somewhat larger estimates are made by the New England Crop Reporting Service, with totals of 174,000 sheep on January 1, 1925, and 181,000 sheep a year later.

It is estimated that about 14,000 mature sheep and 90,000 lambs are slaughtered annually, their value being estimated at $385,000 in the Census of Agriculture of 1925. Wool production in 1924 amounted to 857,789 pounds, having a census value of $340,167.

In earlier days the sheep industry of New England was of outstanding importance. The first agricultural census, that of 1840, reported a total of 3,820,307 sheep in the six States. The raising of breeding stock was then a leading industry, particularly in Vermont, whose sheep were famous the world over as wool producers. The opening of vast grazing and pasture lands in other parts of the world within the last half century, together with the lessened local importance of wool to meet the requirements for textile manufacture, has depressed the sheep industry in the more populous agricultural regions. Most of the present sheep industry of New England centers in small flocks on the rough hill farms, in conjunction with other production, where they contribute their share of the farm money income.

HORSES

Fifty years ago the breeding of horses was important in New England, particularly in Vermont, where the famous Morgan breed was developed. At the present time most of the horses required by the agricultural sections of New England, as well as by the cities for trucking, are purchased from outside sources. Although farm tractors are used to a limited extent in some of the more level regions, horsepower is still the main reliance in New England agriculture. In the intensive farming section of northeastern Maine, in particular, many carloads of western horses are sold in years of agricultural prosperity.

FEED CONSUMPTION

It has been estimated that approximately $80,000,000 is paid annually for supplies of feed shipped into New England from outside sources. While hay, ensilage, and other roughage are produced locally, most of the grain and other feeds consumed by cattle, poultry, hogs, and horses is the product of farms in the American and Canadian West. Although it is difficult to determine the exact amount of feed produced in New England or purchased outside, the following table gives fair estimates of the approximate local production and the net shipments into the region. The total includes the amounts used for human consumption, but most of the net shipments of grain into the region, as well as the supplies produced locally, are consumed by New England livestock. These estimates are believed to be fairly accurate for the present time.

FEEDS AVAILABLE IN NEW ENGLAND IN 1924

[Net tons]

Feed	Produced in New England	Shipped in	Total
Total grain	151, 089	972, 230	1, 123, 319
Oats	89, 810	419, 658	509, 468
Corn	45, 659	438, 863	484, 522
Wheat	3, 204	49, 500	52, 704
Other	12, 416	64, 209	76, 625
Cottonseed		31, 747	31, 747
Linseed		18, 000	18, 000
Other mill products		964, 067	964, 067

These feed requirements are supplied by a well-organized system of private and cooperative merchandising agencies. Special feed stores are maintained in districts where the retailing of feed is important. Many general stores in agricultural sections sell poultry and dairy feed, in addition to groceries and other family supplies. Grain and mill feeds are carried also by many special dealers who buy and sell hay.

Manufacturers of feeds find outlets for their products in New England either through feed brokers or through their own sales organizations which sell directly to the retailers. Some manufacturers deal on a wholesale basis and have also their own chains of retail stores. A number of manufacturers also operate feed mills in

New England, either as local concerns or as branches of national houses.

Cooperation in the purchase of feed by New England farmers is quite highly developed, and local purchasing associations have existed there for many years. One large-scale cooperative concern has built up within the last decade a wholesale business extending throughout New England. This organization operates its own mills and distributes its products through local associations and agents in the rural communities. It sells on advance orders for cash, with delivery from the car door on arrival, thus avoiding storage and warehousing as well as credit charges. The business of a former State cooperative association in Maine is now operated by a leading private grain dealer. In some sections of New England the Grange is an important factor in obtaining feed supplies. High standards of quality are maintained and assured throughout New England by a well-supervised inspection service of the State.

COMMERCIAL FRUITS

The prominent position of fruit growing in New England agriculture is indicated by the fact that apples, cranberries, peaches, and pears produced in 1925 had an estimated total value of upward of $19,000,000. In this total apples were the major item, with $13,500,000; production of cranberries amounted to more than $4,000,000; peaches, to more than $1,250,000; and pears, to considerably less than $500,000.

The income from these various fruits is quite widely distributed among the different States and its total in recent years has exceeded that from any other cash crop except potatoes. Orchard fruits are grown in each State, as are most of the other small fruits, although the commercial production is in some cases confined to certain specialized localities. Cranberries are commercially important only in southeastern Massachusetts. Blueberries grow wild in each of the States and are harvested commercially in Maine, where the canning of this fruit is an important industry in its two southeastern counties. Plums, cherries, and grapes are grown commercially only to a limited extent, and this culture is confined to southern New England.

APPLES

The estimated value of the 1925 apple crop by States was as follows: Massachusetts, $4,740,000; Maine, $3,008,000; Connecticut, $2,269,000; Vermont, $1,543,000; New Hampshire, $1,476,000; Rhode Island, $508,000. Maine has been the leading apple-producing State of New England, but is being rivaled by Massachusetts because of a greater increase in the recent planting of young stock in the latter State. While in Maine there were 2,420,000 apple trees of bearing age in 1925, in contrast to 1,460,000 in Massachusetts, there were in Maine only 432,000 apple trees below bearing age, as compared with 760,000 in Massachusetts.

Approximately one-half of the crop grown in these two States is classed as commercial. In the other States a somewhat higher proportion falls in this class. In recent years the small farm orchard has diminished in importance and the larger commercial plantings are becoming more prominent. In the early days of fruit growing in America a great number of varieties originated in New England, or were brought in from Europe. The older orchards of New England are principally in small farm lots, and they contain a wide range of varieties, some of which are of little commercial value.

While there has been no great increase in the total apple production of this region since 1890—in fact, there has been a decline in the total number of trees—the development of commercial orchards from new plantings is playing an increasingly important part, and the older orchards are rapidly passing out of commercial production. The following table gives the number of bearing trees and nonbearing trees, by counties, together with production and value in 1924 and 1925.

APPLE TREES IN NEW ENGLAND COUNTIES IN 1925, WITH PRODUCTION AND VALUE OF CROP IN 1924 AND 1925

Counties	Apple trees of bearing age, 1925	Apple trees not of bearing age, 1925	Production in bushels		Total value	
			1924	1925	1924	1925
New England	5,935,000	2,005,000	10,762,000	10,304,000	$12,311,000	$13,544,000
Maine	2,420,000	432,000	3,241,000	3,305,000	2,787,000	3,008,000
Androscoggin	258,000	29,600	364,000	364,000	313,040	331,240
Aroostook	71,000	4,000	62,000	65,000	53,320	59,150
Cumberland	125,000	17,000	235,000	210,000	202,100	191,100
Franklin	222,000	47,500	215,000	235,000	184,900	213,850
Hancock	62,000	8,200	73,000	75,000	62,780	68,250
Kennebec	286,000	41,500	330,000	300,000	283,800	273,000
Knox	83,000	15,700	134,000	120,000	115,240	109,200
Lincoln	75,000	18,000	112,000	100,000	96,320	91,000
Oxford	305,000	49,000	474,000	560,000	407,640	509,600
Penobscot	255,000	53,400	283,000	295,000	243,380	268,450
Piscataquis	48,000	6,000	50,000	45,000	43,000	40,950
Sagadahoc	42,000	15,200	70,000	65,000	60,200	59,150
Somerset	202,000	19,200	176,000	190,000	151,360	172,900
Waldo	222,000	77,000	312,000	325,000	268,320	295,750
Washington	42,000	3,100	57,000	58,000	49,020	52,780
York	122,000	27,600	294,000	298,000	252,840	271,180
New Hampshire	621,000	238,000	1,462,000	1,230,000	1,652,000	1,476,000
Belknap	38,700	12,500	78,400	69,700	88,592	83,640
Carroll	23,500	5,000	39,500	43,100	44,635	51,720
Cheshire	45,700	15,600	93,200	79,700	105,316	95,640
Coos	6,600	2,500	7,800	7,700	8,814	9,240
Grafton	44,900	15,400	53,900	52,200	60,907	62,640
Hillsborough	173,100	86,400	448,500	387,000	506,805	464,400
Merrimack	95,000	28,000	236,200	191,700	266,906	230,040
Rockingham	120,200	52,700	329,100	282,400	371,883	338,880
Strafford	42,100	10,600	123,700	76,600	139,781	91,920
Sullivan	31,200	9,300	51,700	39,900	58,421	47,880
Vermont	565,000	180,000	895,000	935,000	1,235,000	1,543,000
Addison	65,300	23,100	108,100	94,300	149,178	155,595
Bennington	30,600	7,500	51,000	54,600	70,380	90,090
Caledonia	15,400	7,700	21,700	27,500	29,946	45,375
Chittenden	46,700	9,500	101,100	86,800	139,518	143,220
Essex	5,300	900	8,800	9,300	12,144	15,345
Franklin	29,600	6,700	47,300	43,100	65,274	71,115
Grand Isle	19,300	3,700	20,800	24,400	28,704	40,260
Lamoille	16,500	3,700	18,700	22,100	25,806	36,465
Orange	43,900	23,700	46,700	92,800	64,446	153,120
Orleans	17,100	7,800	16,700	20,000	23,046	33,000
Rutland	86,400	19,200	191,000	183,000	263,580	301,950
Washington	28,000	13,300	24,400	29,300	33,672	48,345
Windham	103,100	27,200	167,000	160,400	230,460	264,660
Windsor	57,800	26,000	71,700	87,400	98,946	144,210

Apple Trees in New England Counties in 1925, etc.—Continued

Counties	Apple trees of bearing age, 1925	Apple trees not of bearing age, 1925	Production in bushels		Total value	
			1924	1925	1924	1925
Massachusetts	1, 460, 000	760, 000	3, 360, 000	3, 160, 000	$4, 133, 000	$4, 740, 000
Barnstable	8, 700	11, 900	9, 800	7, 200	12, 054	10, 800
Berkshire	73, 700	29, 300	158, 300	176, 400	194, 709	264, 600
Bristol	69, 700	32, 300	67, 100	79, 100	82, 533	118, 650
Dukes	1, 400	500	1, 000	1, 100	1, 230	1, 650
Essex	101, 300	50, 500	216, 800	238, 000	266, 664	357, 000
Franklin	181, 300	69, 100	495, 900	463, 800	609, 957	696, 700
Hampden	88, 900	29, 300	203, 300	158, 100	250, 059	237, 150
Hampshire	130, 800	64, 200	476, 900	443, 700	586, 587	665, 550
Middlesex	376, 790	248, 280	951, 490	886, 080	1, 170, 333	1, 329, 120
Norfolk	36, 400	21, 600	45, 900	47, 100	56, 457	70, 650
Plymouth	55, 800	28, 500	48, 800	64, 100	60, 024	96, 150
Suffolk	10	20	10	20	12	30
Worcester	335, 200	174, 500	684, 700	595, 300	842, 181	892, 950
Rhode Island	166, 000	57, 000	324, 000	299, 000	447, 000	508, 000
Bristol	6, 000	2, 700	7, 500	7, 400	10, 350	12, 580
Kent	15, 300	8, 400	31, 900	29, 700	44, 022	50, 490
Newport	9, 800	5, 000	13, 000	13, 600	17, 940	23, 120
Providence	102, 400	35, 600	242, 100	217, 000	334, 098	368, 900
Washington	32, 500	5, 300	29, 500	31, 300	40, 710	53, 210
Connecticut	703, 000	338, 000	1, 480, 000	1, 375, 000	2, 057, 000	2, 269, 000
Fairfield	112, 400	79, 200	230, 200	214, 000	319, 978	353, 100
Hartford	115, 600	58, 400	229, 200	202, 000	318, 588	333, 300
Litchfield	122, 500	35, 900	202, 500	212, 000	281, 475	349, 800
Middlesex	43, 500	27, 800	96, 900	87, 000	134, 691	143, 550
New Haven	121, 300	67, 000	307, 500	310, 000	427, 425	511, 500
New London	78, 600	20, 100	146, 000	112, 000	202, 940	184, 800
Tolland	50, 100	23, 500	130, 900	115, 000	181, 951	189, 750
Windham	59, 000	26, 100	136, 800	123, 000	190, 152	202, 950

MAINE

Production of apples in Maine is confined to the southern third of the State. High-quality fruit is produced and marketed by the better apple growers of this State, and some of it is exported to England. Its principal market, however, is Boston. Of 291 carloads of Maine apples, whose marketing during the season of 1925–26 was traced to the 10 leading city markets of the country, Boston received 181 carloads, Chicago 63, and New York City 31, while small shipments were made to Atlanta, Baltimore, Cincinnati, Cleveland, Minneapolis, St. Paul, and Washington. The principal apple-producing sections of Maine are in Oxford, Androscoggin, Kennebec, and Waldo Counties, but several other counties are of considerable importance.

NEW HAMPSHIRE

Commercial orcharding has been increasing in New Hampshire and in Vermont during the last few years. In New Hampshire the two southeastern counties of Hillsborough and Rockingham, with Merrimack County adjoining them on the north, form the principal apple-growing district, containing over 60 per cent of the trees of bearing age and 70 per cent of the young trees. Shipments of the 1925–26 crop from New Hampshire includes 98 carloads to Boston, 39 to New York City, 8 to Cincinnati, and 1 to Philadelphia.

VERMONT

Apple growing in Vermont is surpassed in value by the potato crop and by maple products. It is important, however, in the southern and western portions of the State, where the younger orchards are principally in large commercial tracts. The largest apple orchard in the eastern United States is said to be in this section. The larger orchards are in Chittenden, Addison, Rutland, and Bennington Counties, along the western boundary of the State, the first two of these bordering Lake Champlain. There are numerous small orchards also in Windham and Grand Island Counties. The Vermont apple crop is marketed mainly in New York City. Of the crop for the season 1925–26, a total of 254 carloads from this State was shipped to New York, while Chicago received 5, Atlanta 1, and only 1 carload was shipped to Boston.

CONNECTICUT

In Connecticut the production of apples is fairly well distributed, but it is most important in the counties west of the Connecticut River. A large proportion of the commercial crop of this State is produced by a few large growers. There has been a considerable amount of recent planting throughout the State. The crop is marketed locally or is transported by trucks to the New York metropolitan area.

RHODE ISLAND

In Rhode Island the principal apple-growing region is in Providence County, and most of the production of the State comes from a relatively small number of commercial orchards. The product is consumed in the local markets, and no carload movements from this State appear in the 1925–26 records of outside market shipments.

MASSACHUSETTS

Apple growing in Massachusetts is carried on extensively in the Nashoba district, west and north of Boston, which includes portions of Middlesex and Worcester Counties. There are numerous small orchards in this district, some of them on fairly level land, while others are on rolling land, where high production is obtained by the use of intensive orcharding methods. There is one orchard of considerable extent in this region.

The principal production elsewhere in the State is in Franklin County, mainly from small orchards in irregular hillside plantings; but there are some excellent commercial orchards south of Franklin County on the hillsides and rolling land on both sides of the Connecticut Valley, in Hampshire and Hampden Counties. Essex County, in northeastern Massachusetts, also has many apple trees, but these are principally in old, irregular orchards whose production is declining. There are scattered orchards elsewhere throughout the State, both of old trees and of newly planted stock. For the State as a whole there was an increase of 122 per cent in the young nonbearing trees from 1910 to 1920, while the number of bearing trees decreased 10 per cent in this period. From 1920 to 1925 the total number of trees increased, despite the loss of some older orchards.

The bulk of the Massachusetts apple crop is marketed within the State and very little is shipped by railway. A portion is marketed in the locality where it is grown, but the greater part is transported by truck to the larger city markets. Various methods of sale are employed, the most common one for the State as a whole being through commission dealers. About 34 per cent of the State's 1924 production was marketed in this manner, with about 12 per cent direct to the retailer, 18 per cent to country buyers, and about 11 per cent to wholesalers, while upward of 10 per cent was sold from door to door. A considerable volume is sold from the roadside stands, and only a slight proportion is sold through cooperative organizations. The degree to which these various methods of marketing are employed varies considerably in different sections of the State.

On account of nearness to market a considerable portion of the Massachusetts crop is sold ungraded, but the best growers pack their fruit in grades. The apples for local consumption are packed chiefly in open-top wooden boxes containing about a bushel each. The larger commercial shippers in the western part of the State generally pack their fruit in barrels.

PEACHES

The commercial growing of peaches is confined mainly to a small region of Connecticut, in New Haven and Middlesex Counties, where the industry was developed quite extensively by one large grower some 30 years ago. The crop from this district is marketed in the adjacent cities, and in the New York metropolitan area. Although there are small plantings of peaches in other parts of New England, they are not of great commercial importance.

CRANBERRIES

Cranberries are grown commercially only in eastern Massachusetts, which produces approximately 60 per cent of the total cranberry crop of the United States. The only other important cranberry-producing regions outside New England are Long Island, New Jersey, and Wisconsin. In Bristol, Plymouth, and Barnstable Counties, of southeastern Massachusetts, there are about 13,900 acres devoted to the production of this crop. The average annual yield for the four years ended in 1925 was 377,000 barrels, and the value of the crop in 1925 was $4,076,000.

Production is confined to the peaty bogs in the Cape Cod district. The conditions for commercial production, in addition to a deep bed of moisture-holding peat, are a cool climate, near-by supplies of sand for surfacing, and facilities for flooding the cranberry plants during the winter. These conditions are combined in many of the low-lying sections of southeastern Massachusetts and the adjacent islands of Nantucket and Marthas Vineyard.

The expansion of the acreage of cranberry production to its full capacity has been held in check by the requirements for large outlays of capital for developing the bogs, in order to meet the cost of clearing off the original vegetation and débris and applying a covering layer of sand. The cost of planting and of installing the equipment for flooding often makes a total expense of $750 or more per acre. The present tendency is toward the improvement of old bogs and the planting of new ones.

NUMBER AND SIZE OF HOLDINGS

Much of the production is now in the hands of large individual holders and corporations whose activities are confined to this one industry.

Although there are upward of 2,100 individual holdings of cranberry bogs, nearly one-half the total acreage, and much more than half the total production, is concentrated in the hands of a relatively small number of individuals and corporations. There are holdings as large as 250 acres, but many small growers operate either small bogs or separate sections of the larger bogs, some of the holdings being as small as one-eighth of an acre. While some of the smaller holdings have gone into disuse through neglect, because of difficulty in obtaining labor, the production has tended upward as a result of the increased producing capacity of the commercial holdings and of favorable weather conditions of recent years. Efficient marketing methods have increased the income of the growers during the past 20 years; prices have had an irregular trend upward.

MARKETING

The greater portion of the crop is marketed through a single cooperative association, which has developed a high degree of efficiency. Some of the large-scale growers do their own marketing, and there are also local buyers who purchase the crops of the independent small growers. A small proportion of the crop is canned, but the greater portion is marketed fresh during the fall and winter months. In earlier years the entire output was handled by local buyers or shipped to commission houses. Over 50 per cent of the 1925 crop was marketed cooperatively, while 42 per cent was handled by independent distributors, and 4½ per cent was sold for canning.

In the Cranberry Growers' Cooperative Association the Massachusetts producers are united with those in New Jersey and Wisconsin to form an exchange which acts as a national distributing agency. This agency has increased the market by stimulating the consumption of cranberries through a longer portion of the year, by extending the market to new regions and by increasing the demand through advertising and systematic merchandising policies. Careful grading by the association for the wholesale trade with which it deals, with designation of different brands according to variety and quality and with facilities for personal inspection by the consumer, are also important features in the success of the association's policy. The Massachusetts cooperative distributes to almost every State in the Union, largely as a result of efforts to meet the demand in all markets as evenly as possible.

PRODUCTION AND PRICES

Annual production and prices from 1923 to 1927, inclusive, and car-lot shipments by the producing States from 1920 to 1926 are shown in the following tables.

CRANBERRY PRODUCTION AND DECEMBER 1 PRICE, BY STATES, 1923–1927

State	Production (barrels)					Price per barrel received by producers Dec. 1				
	1923	1924	1925	1926	1927	1923	1924	1925	1926	1927
Massachusetts	410, 000	325, 000	429, 000	430, 000	370, 000	$6. 50	$9. 90	$11. 25	$7. 75	$12. 50
New Jersey	205, 000	215, 000	115, 000	210, 000	75, 000	8. 00	8. 75	10. 75	7. 00	11. 00
Wisconsin	37, 000	42, 000	25, 000	80, 000	24, 000	9. 70	9. 20	12. 32	8. 00	13. 50
Washington	----------	----------	----------	16, 600	20, 000	------	------	------	7. 80	12. 00
Oregon	----------	----------	----------	7, 000	6, 000	------	------	------	7. 50	10. 50
United States	652, 000	582, 000	569, 000	743, 600	495, 000	7. 15	9. 42	11. 20	7. 56	12. 28

CAR-LOT SHIPMENTS OF CRANBERRIES BY STATE OF ORIGIN, 1920–1926

State	Crop-movement season						
	1920	1921	1922	1923	1924	1925	1926
Massachusetts	966	644	999	1, 324	1, 045	1, 457	3, 762
New Jersey	452	637	789	713	806	427	797
Wisconsin	82	68	223	140	150	73	309
Other States	2	4	5	6	12	40	34
Total	1, 502	1, 353	2, 016	2, 183	2, 013	1, 997	4, 902

Source: U. S. Department of Agriculture Yearbook, 1927.

BLUEBERRIES

The commercial marketing of blueberries is an important activity in southeastern Maine, particularly in Washington County. This portion of the State has a soil and a climate particularly adapted to their growth. While no figures are available as to the total production, authorities have estimated that this crop brings close to a million dollars a year to the people of the region, where the fruit is canned commercially. In this section of Maine there were about fifteen canning establishments which put up the blueberry crop in 1926.

The method of production on a commercial scale is simple but systematic. The bushes grow in abundance on the cleared rocky soil which was formerly occupied by timber. The brush on this land is burned off about every three years, and then the blueberry bushes take possession of the soil, yielding a crop in the second and third years after the burning. It is difficult to estimate the actual acreage devoted to commercial production, because much of it has never been measured. The principal labor connected with this crop is in harvesting, which is done by hand with the aid of small rakes similar to those used in the harvesting of cranberries. Many families in the sparse population of the producing region depend upon the harvesting of blueberries for their year's income. Experiments in the culture of improved varieties of blueberries are now in progress on Cape Cod.

The canned product from this section has a wide market throughout the country, a large portion of it being consumed by bakeries and restaurants for making pies. Outside this principal producing area blueberries are harvested to a slight extent in other regions of northern New England and shipped to the city markets for consumption as fresh fruit. In 1928 shipments of nine carloads of fresh blueberries were made to the Boston market, coming mainly from a Finnish community near Fitchburg, Mass.

OTHER SMALL FRUITS

The growing of strawberries is of considerable importance in some sections of New England. The region of principal production is in Bristol County, Mass., but strawberries, as well as raspberries, blackberries, and currants, are grown as part of the market-gardening industry in various other regions. The production of these fruits in 1919 had an estimated value exceeding $2,000,000, of which over $1,500,000 was for strawberries. The relative importance of these cultivated small fruits in New England in that year is shown in the following table.

OTHER CULTIVATED SMALL FRUITS IN NEW ENGLAND IN 1919

Small fruit	Acreage	Production	Value
		Quarts	
Strawberries	3, 353	6, 319, 419	$1, 562, 569
Raspberries	1, 679	1, 370, 210	412, 223
Blackberries and dewberries	1, 000	790, 102	176, 400
Other berries	506	146, 566	27, 289
Currants	504	142, 175	26, 351
Total	7, 042	8, 768, 472	2, 204, 832

The small fruits are marketed mainly in the large cities near the producing regions. Those produced in eastern Massachusetts go to the Boston and Providence markets, where they are sold both for local consumption and for reshipment by truck to neighboring cities. Many of the growers haul their own product directly to the city markets, but some of the larger growers have special salesmen or sell through commission houses.

COMMERCIAL VEGETABLES

The vegetables produced commercially in New England are grown principally in certain specialized areas having particularly favorable soil conditions, where attention is concentrated largely upon a single crop. These areas thus have both the advantages and the disadvantages resulting from dependence upon a single source of money income.

POTATOES

Of the vegetables that are grown commercially in New England, potatoes overshadow all the others, both in acreage and in value. This is the leading cash crop, as indicated by its total income to the region; its value in 1925 exceeded that of all the hay produced on the farms of the six States. The potato crop of this section is important nationally as well as locally, for it ordinarily contributes more than one-tenth of the whole main-crop yield of the United States. Maine alone contributed more than one-tenth of the national production, both in 1925 and 1926.

PRODUCING AREAS AND PRODUCTION

While potatoes are grown in all farming districts of New England for home consumption and for local markets near the cities, their commercial production is of chief importance in northeastern Maine, principally in Aroostook County, which is the center of this industry. This single county in 1925 produced more potatoes than any State of New England outside of Maine, and this State produced over 80 per cent of the New England total. Vermont and Connecticut produced more than 2,000,000 bushels each, Massachusetts nearly 2,000,000 bushels, and New Hampshire approximately 1,600,000 bushels. Hartford County, in Connecticut, produced more than $1,000,000 worth of potatoes in that year. The production of certified seed potatoes is an important branch of this industry in each of the three northern States. The importance of each State in potato production in 1924, 1925, and 1926 is shown in the following table.

Potato Production in New England, 1924–1926

State	Acreage			Production in thousands of bushels			Value in thousands of dollars		
	1924	1925	1926	1924	1925	1926	1924	1925	1926
Maine	140, 000	135, 000	127, 000	44, 100	33, 750	36, 830	18, 963	68, 340	46, 984
Vermont	21, 000	19, 000	20, 000	3, 360	2, 375	3, 100	2, 856	5, 644	4, 340
Massachusetts	15, 000	14, 000	13, 000	2, 250	1, 960	2, 015	2, 160	5, 145	3, 627
Connecticut	15, 000	15, 000	14, 000	1, 950	2, 025	2, 170	1, 950	5, 063	3, 906
New Hampshire	11, 000	11, 000	11, 000	1, 870	1, 595	1, 815	1, 571	3, 748	3, 086
Rhode Island	2, 000	2, 000	3, 000	280	280	450	266	686	810
Total	204, 000	196, 000	188, 000	53, 810	41, 985	46, 380	27, 766	88, 626	64, 753
United States	3, 348, 000	3, 092, 000	3, 163, 000	323, 243	323, 465	357, 800	266, 047	605, 327	499, 602

Source: New England Crop Reporting Service and U. S. Department of Agriculture.

The center of New England potato growing is an elongated strip of gravelly loam with a length of about 60 miles, extending north from Houlton along the eastern edge of Aroostook County and along the St. John River to Fort Kent, and eastward from Ashland to Fort Fairfield, and having a maximum width of 25 or 30 miles. The potato-growing region extends southward and westward, also, into Penobscot and Somerset Counties, each of which produced more than $1,000,000 worth of potatoes in 1925.

The soil of this region is stony, but its lightness makes it especially adapted to potato growing. The low temperature prevailing throughout the growing season, and the well-distributed rainfall of northern New England provide ideal growing conditions, which are of equal importance to that of soil. Only a small portion of the total land suitable for potato growing in the Aroostook section is under cultivation, and not more than a third of the crop land is planted in potatoes in any one year. Production could be readily increased in this and adjoining regions when warranted by market conditions.

Although potatoes have been grown in considerable quantities in northeastern Maine for the last 60 years, the commercial importance of this crop has increased greatly within the last 30 years, largely as a result of the building of the Bangor & Aroostook Railroad, which opened this country to rail transportation. This railroad now handles from 70 to 75 per cent of the annual potato shipments. The production in 1895 was something above 10,000,000 bushels, but it increased rapidly after 1901, reaching in 1914 over 40,500,000 bushels; this has been exceeded only by the crop of 1924. Production fluctuates considerably from year to year, both on account of weather and crop conditions, and also because of variation in acreage planted. In consequence of the natural advantages of the region and the good farming methods practiced, there has been a steady increase in yield per acre. It is now about three times that of the average for the whole country; it was estimated in 1926 at 290 bushels per acre. This is the result of intensive cropping, with a very liberal use of commercial fertilizers, and thorough spraying of the growing plants to check disease and insects.

MARKETING

Of the total production of Maine potatoes in 1925 and 1926, approximately 75 per cent was shipped out of the producing region, about 8 per cent consumed locally, between 6 and 7 per cent required for the next year's seed, and a little more than 4 per cent fed to animals or used for making starch. Between 5 and 7 per cent was allowed for shrinkage. The largest part of the crop is thus shipped commercially for table consumption. In former years a considerable portion of the crop was consumed in the manufacture of starch, and there are numerous starch factories in the potato-growing and shipping sections. Only the rejected low-grade potatoes are now used for this purpose, excepting possibly in years of extremely low prices, when some of the better stock is so consumed.

Most of the growers sell their crop at harvest time to resident local buyers, who make a specialty of marketing the crop, acting as brokers having connection with dealers in the larger points of consumption. Some of the potato buyers are also large-scale producers, growing several hundred acres individually. Some years ago a cooperative association for marketing the crop was organized, in which a large proportion of the potato growers were members. This association was discontinued after a few seasons of activity, although several local associations which were part of this cooperative organization are still doing business. Since 1925 the American Fruit Growers' Exchange has handled a considerable part of the crop. One of the national chain-grocery organizations has extensive agencies for buying, storing, and shipping potatoes from Aroostook County. Potatoes are generally collected for grading at the warehouses along the railroad sidings, where they are either shipped immediately or stored in bins. Shipments are made by rail, both in bags and in bulk. Most of the crop moves to market during the cold months. Refrigerator cars are generally used, and these are heated during cold weather.

The crop of Maine potatoes is marketed in a wide territory, the extent of which depends largely upon the size of the crop and the production in other sections of the United States. The crop of 1924–25, with total shipments of 43,070 carloads, found markets in every State east of the Mississippi and in five States west of it, in addition to Canada, Cuba, and the British Isles. Between September 12 and March 26 of that season, when records were collected for 30,783 cars, direct shipments, amounting to over 1,000 carloads, were made to each of five States as follows: Massachusetts, 9,605; New York State, 8,198; Pennsylvania, 2,302; Connecticut, 1,947; Rhode Island, 1,320. Four other States received shipments exceeding 500 carloads each, namely, Maine, 944; Virginia, 942; Florida, 762; Georgia, 625. Each of the following States received over 300 carloads: New Hampshire, 451; South Carolina, 435; North Carolina, 355; Maryland, 302; Texas, 302. Besides these, Ohio received 148 carloads; Alabama, 81; West Virginia, 60; Tennessee, 57; District of Columbia, 52; Delaware, 27; Indiana, 24; Kentucky, 23; Illinois, 21; Missouri, 18; Mississippi, 20; Oklahoma, 17; and other destinations, 36.

A considerable portion of the Maine crop is shipped for seed to other sections, notably to Long Island and to the South Atlantic and Gulf States as seed for the early crop, which, in turn, is shipped to the northern markets for consumption.

The production of certified seed potatoes is important in Maine, also in northern Vermont and in New Hampshire. A total of nearly 2,500,000 bushels was produced by these three States as certified seed in 1926, of which Maine produced 2,295,000 bushels, Vermont 154,400 bushels, and New Hampshire approximately 29,000 bushels. In the preceding season Maine shipped 1,667 carloads of certified seed potatoes to 16 States besides the District of Columbia. Each New England State and each State fronting on the Atlantic seaboard was represented in these shipments of seed potatoes, as well as Indiana in the interior. Shipments from Vermont are made largely to Connecticut and New York State, Long Island being the largest purchaser. Some shipments are made to New Jersey, and a few sales are made in Virginia and Pennsylvania. The other States of New England use small portions of certified seed as foundation stock. On the other hand, the potato growers of northern New England bring in considerable shipments of seed potatoes from New Brunswick, as a means of maintaining the quality of their own foundation seed stock.

ONIONS

The commercial growing of onions, aside from the production in market-gardening operations, is confined principally to the upper part of the Connecticut River Valley within the State of Massachusetts. Although onions were formerly grown extensively in the eastern part of the State, notably about the town of Danvers, in Essex County, general market gardening has taken the place of this crop in the areas adjacent to metropolitan Boston. The level lands of the valley north of the Holyoke Range now constitute the principal onion-growing district.

The commercial onion crop of New England in 1924 had an estimated value of $1,232,000, and in 1925 of $1,778,000, based upon December prices. This industry was seriously affected by the postwar agricultural depression, when prices declined to low levels under competitive conditions then prevailing. Considerable reducton of acreage and production took place up to 1925, but since then both have increased.

Heretofore the greater part of the onion crop has been raised from seed, but within the last few years about half the crop has been produced from sets, which mature much earlier in the season. The experiment station at Amherst is now attempting to develop a milder type of onion, adapted to local growing conditions and to the demands of the New England market.

Figures of acreage, production, and price per bushel for onions grown in Massachusetts are shown in the following table.

ONION CROP IN MASSACHUSETTS, 1925–1927

Year	Acreage	Production in thousands of bushels	Price per bushel	Car-lot shipments
1925	3, 920	1, 533	$1. 08	2, 856
1926	4, 420	1, 746	. 62	3, 686
1927	4, 550	1, 342	. 74	(1)

[1] Data not available.

Onion growing in this region is a combination of American farming methods and Old World peasant farming. On account of the large quantity of hand labor required for weeding and harvesting the crop, the actual work of production is largely in the hands of Polish and Lithuanian families. Men, women, and children all take part in the laborious handwork. These thrifty people of immigrant stock are rapidly coming into ownership of much of the land on which in former years they worked for the native American owners for wages or grew the crop on shares. Modern machinery and commercial fertilizers are used extensively along with the hand labor.

The crop is marketed largely through a limited number of resident buyers. The crops produced from sets, maturing in August, are transported by truck direct from the fields to the railways. Much of the late crop maturing in September is placed in local storage houses for shipment during the winter season. The market for the onion crop covers a fairly wide territory in the neighboring States but is not nearly so extensive as that for the New England potato crop.

SWEET CORN AND OTHER VEGETABLES FOR CANNING

Sweet corn.—The growing of sweet corn for canning has attained the rank of a specialized commercial crop, holding a place of importance in northern New England corresponding to that of onions in Massachusetts. The principal production of sweet corn for canning is in the State of Maine, whose acreage, production, and total value in 1925 was approximately 80 per cent of the New England total. In that year there were 19,720 acres in New England, and the total value of product was $1,539,000. The acreage in Maine was 15,630 and value of crop, $1,312,000; acreage in Vermont was 2,620 and value of crop, $131,000; acreage in New Hampshire was 1,470 and value of crop, $96,000.

Nearly one-half of the total acreage and value of the crop in Maine was in the three counties of Oxford, Somerset, and Kennebec. Other important producing counties in Maine were Cumberland, with 1,720 acres and crop valued at $135,140; Androscoggin, 1,430 acres and crop valued at $110,648; Penobscot, 1,480 acres and crop valued at $116,719; Waldo, 1,220 acres and crop valued at $105,291; Franklin, 1,270 acres and crop valued at $124,724; and York, 560 acres and crop valued at $44,164. Besides these there were 280 acres in Lincoln and Knox Counties, with a crop valued at $26,367, and 10 acres in Piscataquis County.

In Vermont, Chittenden County had more than twice as much sweet-corn acreage as any other county in the State, with 840 acres and a crop valued at $45,224. The other counties, in order of importance, were Franklin, Grand Isle, Orange, Windham, Washington, and Windsor. In New Hampshire the principal counties are Rockingham, with 460 acres and a crop valued at $28,750; Merrimack, 410 acres and crop valued at $25,625; and Carroll, 330 acres and crop valued at $23,425. The other New Hampshire counties in order are Strafford, with 80 acres; Belknap, with 60 acres; Grafton, with 50 acres; and Cheshire and Sullivan, with 40 acres each.

The high quality of the sweet corn produced in northern New England, where the cool climate produces an especially fine flavor, has been an important factor in the development of this industry. The canned product is well liked in the market where it is known, and it usually commands a premium in price. It has to meet competition, however, from the large-scale production of the farms of New York, Wisconsin, and other States, and this competition is a factor in keeping down the acreage in New England. Most of the corn in New England is grown in relatively small fields of a few acres, scattered about a large area; production in the West is in larger fields and canning operations are carried on in larger units and at a lower cost.

SWEET-CORN ACREAGE, PRODUCTION, AND PRICE PER TON, BY STATES, 1924–1927

State and year	Acreage	Production in tons	Price per ton
Maine:			
1924	13, 390	36, 200	$29. 10
1925	15, 630	45, 300	29. 76
1926	14, 650	46, 900	28. 72
1927	8, 260	23, 100	22. 30
New Hampshire:			
1924	1, 200	3, 400	24. 40
1925	1, 470	3, 800	25. 00
1926	1, 050	2, 400	23. 65
1927	780	1, 800	21. 60
United States:			
1924	302, 790	527, 800	14. 17
1925	393, 910	1, 014, 100	15. 04
1926	317, 310	816, 000	13. 23
1927	213, 830	395, 800	12. 13

Peas.—The production of peas for canning has become of some importance in Maine, especially in Oxford, Somerset, and Waldo Counties, where it has been on the increase in the last few years. The value of this crop was $63,000 in 1924 and $112,000 in 1925. Considerable expansion appears feasible in conjunction with the growing of sweet corn, as the cool climate of this region is an important factor in quality production of both crops. Difficulties encountered with the green pea louse have curtailed production in the last year or two.

GREEN-PEA ACREAGE, PRODUCTION, AND PRICE PER TON IN MAINE, 1924–1927

Year	Acreage	Production in tons	Price per ton
1924	1,030	900	$70
1925	1,770	1,600	70
1926	1,410	600	70
1927	690	600	70

Tomatoes.—The growing of tomatoes has been of some local importance in a small area of southern Connecticut, centering about the town of Guilford, where there is a cannery that supplies a considerable market with its product.

DRY BEANS

Production of dry beans as a cash crop is of some importance in Maine and in Vermont, although unimportant in the other New England States. Its total value for New England was estimated at $544,000 in 1924 and at $478,000 in 1925. In the latter year the value of Maine's crop was $280,000 and that of Vermont's crop was $198,000. Each of these States had about 4,000 acres in production. The crop in Maine is grown in small acreages, scattered throughout the State, but in Vermont a specialized region in Grand Isle County with relatively large acreages produces about 60 per cent of the State's output.

MARKET-GARDEN CROPS

The importance of market gardening in terms of money value to the producer is hard to ascertain, and the acreage and production are subject to rather broad estimates. The census of 1925 gives for all New England a total of nearly 48,000 acres devoted to market-garden products, but this apparently includes sweet corn grown for canning as well as that for fresh consumption. In the total figures Massachusetts was in the lead with 18,428 acres, followed by Maine with 14,226 acres; Connecticut, 7,863; New Hampshire, 3,026; Vermont, 2,670; and Rhode Island, 1,896. The acreage in each State for each of the seven vegetables included in the census figures, together with strawberries, is shown in the following table.

ACREAGE IN MARKET-GARDEN CROPS IN NEW ENGLAND STATES IN 1925

Crop	New England	Maine	New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut
Cabbage	4,918	590	254	216	2,571	212	1,075
Cantaloupes and muskmelons	407	33	16	19	144	28	167
Lettuce	1,158	67	40	23	800	55	173
Onions (dry)	3,936	64	52	86	3,422	42	270
Sweet corn	30,817	12,574	2,182	2,039	8,462	1,200	4,360
Tomatoes	3,455	180	123	96	1,618	260	1,178
Watermelons	102	4	7	11	38	11	31
Total	44,793	13,512	2,674	2,490	17,055	1,808	7,254
Strawberries	3,397	714	352	261	1,373	88	609

Source: U. S. Census of Agriculture, 1925.

AREAS OF SPECIALIZATION

The highest development of market gardening is in the vicinity of the large industrial centers. The most important specialized market-gardening regions are an area in eastern Massachusetts, north of Boston, and a similar area southeast of Providence, in Rhode Island. In these two districts the industry has been highly developed by farmers of native New England parentage, whose operations are carried on extensively in fairly large-sized units. Operations are conducted also on a smaller scale by Italians and others of foreign stock.

The area adjacent to metropolitan Boston extends from Boxboro to Danvers, dipping down to include parts of the towns and cities adjacent to the northwestern border of the metropolitan area. The Providence area extends in a belt down through the center of Bristol County, in Massachusetts, to include the eastern edge of Rhode Island. There are several small market-gardening districts in northeastern Massachusetts which supply adjacent cities. Southwest of Worcester is the producing area which supplies that city. In the neighborhood of Fitchburg there are market-gardening activities of considerable importance, largely operated by families of Finnish stock, whose operations are mainly on a small scale. Similar local producing areas exist adjacent to Springfield, Pittsfield, and the larger cities of Connecticut. In the lower Connecticut River Valley, and in some other scattered areas which have the advantage of peculiarly good soil conditions, market-gardening is carried on by local farmers, who do not produce for any particular city but ship to various markets.

Formerly the industry was located nearer to the consuming centers, but in the last two decades the introduction of the motor truck has made more remote producing regions accessible to the centers of consumption. Expansion of residential areas of the cities through real-estate developments also has preempted much of the former gardening areas, so that the industry has been forced out into the surrounding country. The increase in land prices near the cities has made these changes profitable to the farmer owners, who are probably the only farming class which has profited materially from this source.

Akin to the intensified methods used in market gardening is the production of vegetables and flowers under glass. This is an industry whose importance is quite comparable with that of the outdoor production of garden crops. The total value of greenhouse products in 1919 was about three-quarters as much as that of vegetables grown in the open air, exclusive of potatoes. A recent study at Amherst Agricultural College showed that in 1927 there were 152 acres of vegetables under glass in Massachusetts, and the gross value of the crops was about $6,000,000. Vegetable forcing had its start in the vicinity of Boston.

SPECIALTY CROPS

There are two important products of New England rural life—maple products and tobacco—which do not admit of ready classification. These are therefore discussed separately from fruits and vegetables.

MAPLE SUGAR AND SIRUP

New England's most distinctive rural product, made from the sap of its maple trees, ranks fourth or fifth among the individual sources of farm income, with an importance in money value next to that of cranberries. Maple products in 1925 had a reported value of $3,150,000. Of this amount more than four-fifths came from the sale of maple sirup and slightly less than one-fifth from maple sugar. The yield in that year was 2,169,000 pounds of maple sugar and 1,224,000 gallons of sirup.

The principal production is in the State of Vermont, which produces nearly 75 per cent of the value of the New England product. Although in 1909 Vermont was surpassed in the value of its maple products by New York State and Ohio (and New York State was nearly as important in 1919), the relative importance of Vermont as the leading State in the industry has increased in recent years. Considerable quantities of maple sugar and sirup are produced also in New Hampshire, Maine, and Massachusetts, and a small quantity in Connecticut. The greater proportion of the sugar is produced in the counties of northern Vermont, while the production of sirup is more widely distributed throughout the maple-producing sections. An increasing proportion of the total crop is marketed in the form of sirup.

A large portion of the maple sirup for table consumption is distributed through the grocery trade. Most of the product is handled by large dealers, who buy and market much of the Canadian output as well as the American. In the past, a considerable proportion of the output has found a market outside of direct human consumption as a sweetening medium for chewing tobacco. Limited results have been obtained through market organization of this industry, but in one section of Vermont a cooperative association has for some years marketed the output of its members. Although improved methods of production have been put into effect in recent years, with a resulting improvement in quality of the product, much might be done in developing more fully the market possibilities of this industry. As the product of a permanent and distinctive native resource of the region, it merits the fullest possible development.

TOBACCO

Among the money crops of New England agriculture, the value of tobacco holds second or third place, being surpassed by the income from potatoes, and sometimes by that from the apple crop. Tobacco is distinctly a regional product, confined to a small area of the Connecticut River Valley, extending northward from Hartford to the limits of northern Massachusetts, with small producing areas both north and south of these limits. There is also a limited production in the Housatonic Valley of Connecticut. From year to year the value of the product in these areas fluctuates widely, depending upon the market price.

As early as 1859 this region produced upward of 9,000,000 pounds of tobacco, and by 1879 the amount had increased to nearly 20,000,000 pounds. From 1910 to 1920 the production increased materially, but since then has fallen off. During the last decade the crop has averaged about 50,000,000 pounds, although there have been sharp fluctuations from year to year.

ACREAGE AND PRODUCTION

Figures of acreage and production from 1921 to 1927, and of yield per acre and prices from 1923 to 1927 are shown for Massachusetts and Connecticut and for the entire United States in the following tables.

NEW ENGLAND TOBACCO ACREAGE AND PRODUCTION, BY STATES, 1921–1927

State	Acreage				Production in thousands of pounds			
	Average, 1921–1924	1925	1926	1927	Average, 1921–1924	1925	1926	1927
Massachusetts	9, 120	8, 600	6, 500	7, 100	11, 750	10, 690	9, 412	8, 683
Connecticut	29, 280	29, 600	21, 900	23, 600	38, 812	40, 019	29, 346	28, 886
All other United States	1, 692, 420	1, 757, 300	1, 656, 400	1, 610, 200	1, 291, 922	1, 376, 628	1, 297, 889	1, 237, 832

TOBACCO YIELD PER ACRE AND ESTIMATED PRICE PER POUND, BY STATES, DECEMBER 1, 1923–1927

State	Yield per acre					Estimated price, cents per pound				
	1923	1924	1925	1926	1927	1923	1924	1925	1926	1927
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*					
Massachusetts	1, 410	1, 340	1, 243	1, 448	1, 223	43. 8	26. 8	16. 0	35. 0	37. 0
Connecticut	1, 388	1, 370	1, 352	1, 340	1, 224	46. 5	32. 3	19. 0	35. 6	36. 0
United States	807	734	783	784	769	19. 9	20. 7	18. 2	18. 2	21. 5

The growing of tobacco involves a number of operations quite apart from the usual processes of agriculture. Harvesting, drying, and curing of the matured crop all require careful handwork, in which a large part of the labor is performed by Polish immigrants, who have recently come to play an increasing part in tobacco growing as proprietors of the land and crop which they cultivate.

The principal production of the Connecticut Valley tobacco is sold for cigar wrappers. The poorer qualities are used for binders and for cigar fillers. This district does not compete in producing the cheaper grades used for making cigarettes. Most of the tobacco is grown in the open air, but in recent years a considerable and increasing amount of shade-grown tobacco has been produced. There were some 6,800 acres of tobacco grown under cloth in 1924. The peculiar quality of the soils has much to do with the quality of the product. Much of the lighter soil in the valley, some of which was considered almost worthless for other crops, is now devoted to the intensive production of tobacco. Commercial fertilizers are used extensively.

MARKETING

Up to a few years ago marketing of the tobacco crop in this region was solely in the hands of a special group of dealers, who bought the product from the farmer. In determining the price offered they gave secondary attention to quality and grades. After the close of the World War, county marketing associations were established to take over the packing and selling operations for the growers, and a selling federation was formed. Under this arrangement the local associations were able to obtain limited loans on the tobacco in their packing houses, but full payment was not obtained by the growers until at least a year after the crop was harvested.

This plan was succeeded by a single, centralized association, which held contracts for 60 per cent of the sun-grown acreage. Inability to better the market price, in consequence of increasing stocks on hand with no curtailment of production, forced the association to abandon its contracts for future crops. The poor returns of the tobacco growers in the last few years, however, have led to considerable curtailment of this industry, and some of the growers have turned their attention to production of other income-bearing crops in its place.

COMMERCIAL FERTILIZERS

New England uses a comparatively large volume of commercial fertilizers. This is due not so much to the depletion of soil fertility as to the intensive cropping which makes the addition of commercial fertilizer necessary for high yields. Fertilizers are used more generally on the naturally rich soils than on the poorer lands of the hills, where there is real depletion. The heaviest applications of fertilizer are on the recently cleared potato fields of Maine, the rich soil of the Connecticut Valley, where onions and tobacco are raised intensively, the market-garden areas near the cities, and the better orchards. Very few of the hillside pastures get the fertilizer which they might use to advantage.

RELATIVE CONSUMPTION

The following table of comparisons gives a general idea of the importance of agricultural chemicals in New England. It will be noted that for the acreage of crops which are normally sold from the land the use of fertilizer is particularly high in this section. The large area of pasturage and feeding crops brings down to second place New England's rank in the use of fertilizer per acre of total improved land or of total crop acreage. The concentration of nitrogen in the fertilizer in average use is moderately high, that of phosphoric acid low, and that of potash the highest found in the country.

ESTIMATED APPLICATION OF FERTILIZER AND CONCENTRATION IN PLANT FOOD IN NEW ENGLAND AND OTHER SECTIONS OF THE UNITED STATES IN 1923

Geographic section	Total fertilizer tonnage	Pounds applied per acre on the basis of—			Approximate concentration in plant food		
		All improved land in farms	Total area in crops with acreage reports	Acreage in crops normally sold	Nitrogen	Phosphoric acid	Potash
					Per cent	*Per cent*	*Per cent*
New England	351, 709	115. 0	165. 0	1, 341	3. 92	6. 85	4. 59
South Atlantic	3, 670, 476	151. 0	230. 0	533	3. 06	10. 15	3. 16
Middle Atlantic	839, 001	63. 0	99. 0	442	1. 22	10. 49	3. 29
East South Central	856, 260	39. 0	54. 0	157	2. 47	8. 00	3. 00
East North Central	615, 414	14. 0	20. 0	105	. 76	13. 93	2. 77
Pacific	82, 819	7. 0	13. 0	43	8. 19	5. 17	3. 39
West South Central	259, 785	8. 0	10. 0	18	2. 46	8. 00	3. 00
West North Central	60, 500	. 7	1. 0	4	. 68	15. 79	. 50
Mountain	3, 900	. 3	. 5	1			

Source: Sidney B. Haskell, "Fertilizer Use in the United States," The Annals, January 1925, p. 265 (Based upon 1923 data.)

The tonnage of commercial fertilizer used annually in each of the States and in the whole region from 1922 to 1927 is shown in the following table. For Massachusetts and Maine the data are based upon actual records of sales, computed in connection with the collection of a tonnage tax. The estimates for the other States are made by State officials conversant with the actual local situation. While there was a decrease in the period of the postwar depression, the tonnage is now gradually increasing.

FERTILIZER CONSUMPTION BY STATES, 1922–1927

State	Fiscal year ending—	1927	1926	1925	1924	1923	1922
Total New England		374, 397	363, 920	371, 160	364, 404	350, 709	349, 486
Maine [1]	Dec. 31	194, 000	192, 000	185, 000	182, 000	168, 000	172, 000
New Hampshire	June 30	19, 000	16, 000	16, 000	16, 000	17, 000	15, 000
Vermont	June 30	15, 663	18, 000	18, 000	17, 000	18, 000	16, 000
Massachusetts [1]	June 30	71, 734	58, 920	62, 656	61, 968	63, 709	65, 986
Rhode Island	Mar. 31	9, 000	9, 000	9, 504	8, 800	9, 000	8, 500
Connecticut	June 30	65, 000	70, 000	80, 000	78, 636	75, 000	72, 000

[1] From State records.

Source: American Fertilizer Handbook, 1928, p. 22.

TYPES AND SOURCES

These tonnage figures apply to the fertilizer as sold. In 1924, 223,935 tons of fertilizer were shipped into New England and 94,371 tons shipped out, making a net inward movement of 129,564 tons.[1] With certain reservations it may be said that the remainder is manufactured within New England. (See p. 561.) Farmers are buying less of the low-analysis fertilizers containing a high proportion of inert filler. There is a considerable actual manufacture of commercial fertilizer from raw materials as well as much mixing by establishments in New England. The fish residue, with decreasing proportions of tankage from the slaughter houses, furnishes a large tonnage of fertilizer ingredients. Lime is the only agricultural mineral obtained locally, and there are no nitrogen fixation plants in the district, but there is a considerable production of sulphate of ammonia from gas plants. In the past there has been a considerable sale of horse manure near the cities, but this, of course, is now of little importance.

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[1] See External Trade of New England, p. 8. Domestic Commerce Series No. 22, U. S. Department of Commerce. 1928.

MERCHANDISING OF FERTILIZERS

The merchandising of fertilizers is highly seasonal. Solicitation for the next season's orders begins in November and lasts into the spring. It is accomplished by a variety of special agencies. The leading fertilizer producers and distributors, both national and local, have agents who canvass the farmers in the special crop sections. These agents take orders from the farmers in advance of shipment. As a rule, these concerns employ leading local farmers, or other representatives, to whom the fertilizer is shipped. They attend to the unloading of the cars and to the distribution of the goods. Most of the sales through these local agents are made on extended credit, which is handled by the manufacturers. As a rule, the larger cooperative purchasing concerns which handle feed sell fertilizer on the same basis. This is usually a matter of cash payment for car-door delivery on goods ordered in advance.

In communities where there is no particular concentration of fertilizer purchases no direct solicitation is done among the farmers by the commercial agencies. Fertilizers are carried in local stores with feed or seed or are handled by farmer agents. Near the cities there is a considerable sale to suburban dwellers for use in vegetable and flower gardens. This is usually handled by stores which specialize in the sale of seeds and other garden materials.

Each of the States maintains an inspection service for fertilizers. Only brands registered and conforming to State fertilizer laws may be sold.

FOREST RESOURCES

The significance of forestry in the economic life of New England, and the desirability of the fullest practical development of its timber resources, is apparent from the fact that two-thirds of the entire land surface of New England is in forest or is potential forest land. This proportion is more than twice that of the forest area for the entire United States, and it exceeds that of any European country except Finland and Sweden. In Maine 78 per cent of the total land area is in forests; the proportion ranges in different counties from a minimum of 43 per cent to a maximum of 91 per cent. Even in the densely populated State of Massachusetts there are townships within 50 miles of Worcester with over 90 per cent of their area in forests. The forest area of New Hampshire covers more than two-thirds of the State; in the other New England States the proportion in forest ranges from 40 to 50 per cent of the land surface.

The United States Forest Service in 1920 classed as forest approximately 26,000,000 acres of New England land, representing 5.7 per cent of the total forest acreage of the Nation. Some 15,000,000 acres of this total were in Maine, representing 58 per cent of the New England total; nearly 4,000,000 acres were in New Hampshire, comprising 15 per cent; in Vermont there were 2,800,000, amounting to 11 per cent; and in Massachusetts, 2,241,000 acres, representing 9 per cent of the New England total. In Connecticut there were 1,451,000 acres in forest, and in Rhode Island 280,000 acres. Of the total forest acreage of New England 85 per cent is located in the three northern States, and only 15 per cent in the three southern States.

The forest area of this section has been on the increase for some time and it is still increasing, chiefly at the expense of lands that were formerly cultivated. Since the Civil War there has been a steady reversion of farm land to forests. It is estimated that the New England States as a whole now have a forest area which is probably 15 per cent greater than it was 60 years ago. In New Hampshire the decrease in the improved farm land in the last 60 years amounted to 1,664,000 acres, representing a falling off of 71 per cent.

IMPORTANCE OF FORESTS

A considerable portion of the forest area of New England consists of farm wood lots. More of the total farm area is in these wood lots than in improved farm land. The woodlands on privately owned farms in New England, including natural or improved wood lots and young growth on cut-over land, amounted in 1925 to 7,300,000 acres, which is nearly one-half the total area in farms in the six States. Much of the rocky and hilly farm land of New England can be employed in systematic forestry more profitably than in agriculture. Most of the land that has reverted to forestry in the last two generations is of this type, and it is still undergoing the process of natural reforestation.

Forestry in New England goes hand in hand with diversified agriculture. It has an especially important place in sections where the range of profitable farm crops is limited. On many a farm of northern New England a substantial part of the income is from the sale of forest products, supplemented by maple products and the income from the dairy herd. The support of forestry as a farm activity is thus an aid in maintaining the prosperity of the rural sections of New England. The more profitable the wood lot becomes, the easier it is to sustain other farm activities.

The various industries of New England which depend upon wood (see p. 481) for their raw materials have a natural advantage over industries which must obtain their raw material from outside sources. The industries dependent upon wood have a large capital investment in this region. Although they tend to shift slowly and reluctantly to new locations, yet their permanent retention here depends largely upon the availability of near-by materials in present locations. The wood-using establishments which are scattered about New England, particularly in the northern part, often provide the only local manufacturing activity. Many of them get their supplies from their immediate neighborhoods. The continued industrial life of such communities thus depends largely upon the maintenance of adequate forest materials. The cost of transporting these materials from outside sources makes it increasingly important to produce them near by.

The importance of the activities which depend upon wood for raw material is indicated by the fact that in 1925 they together provided a market for upward of $240,000,000 worth of raw materials used in manufacturing, including fuel and supplies, and they paid more than $90,000,000 in wages to upward of 76,000 wage earners. The products of the wood-using industries of New England had an aggregate value in 1925 exceeding $425,000,000.

This region consumes about one-half the pulpwood of the whole country, and manufactures more than one-half the wood pulp. Maine leads all the other States of the Union in the amount of wood pulp produced, and New Hampshire occupies fifth place. The pulp and paper mills of New England consume nearly 2,000,000 cords of pulpwood annually. The value of this material in 1926 was nearly $34,000,000, and the wood pulp which they produced in that year had a value exceeding $63,000,000. In the outlay for materials and in the income brought to the people of New England the paper and pulp industries contributed considerably more than one-half of the total for all the wood-using industries of New England.

Other important activities depending upon wood resources are the manufacture of furniture, packing boxes, planing-mill products, toys, and various other turned and carved wood products.

This region in recent years has become more and more dependent upon other sections for lumber used in construction. Maine is the only State which is now able to meet all its timber requirements from its own forests. Increasing quantities of lumber are brought in each year from the Southern States, from the Pacific Northwest, and from Canada. The New England States pay out more than $10,000,000 a year in freight bills on lumber shipped in from other parts of the United States, and nearly $1,000,000 on imported lumber.

New England's proximity to the great lumber-consuming regions of the Eastern and Central States gives it a favorable position to compete in their future lumber markets, when the supplies of virgin timber from distant sources become more inaccessible and more costly. The future products of New England's large acreage of forest land thus have in prospect a ready and profitable market near at hand.

The conservation of New England forests has important economic significance in its bearing upon water power. Since large portions of this region are mountainous or hilly, a forest cover is necessary to protect the water supply and to maintain the regularity of stream flow, in order to provide a maximum volume for hydroelectric power and for domestic supplies. The principal power-producing rivers of New England—the Penobscot, Kennebec, Androscoggin, Merrimack, and Connecticut—all have their origin in mountain forests where the standing timber is an aid in providing natural reservoirs.

Full realization of the economic advantage afforded by the recreational attractions of this section depends, likewise, upon the maintenance of New England forests, which have a beneficial influence on climate that should not be ignored. Maintenance of wild life and the opportunity afforded for hunting and fishing provide not only recreational attractions to tourists but they bring direct revenue from hunting and fishing licenses and from the expenditures of campers and tourists.

PRESENT STAND OF TIMBER

The present stand of saw timber in New England is about one-eighth of the original stock, and now comprises only 2¼ per cent of the estimated saw timber of the entire United States. There are less than 2,000,000 acres of virgin timberland remaining in New England. The rest of the forest has been cut over within the past two or three generations. More than three-fourths of this stand is estimated to be softwood—principally spruce and fir, these representing 62 per cent of all the softwood. White pine and Norway pine comprise about 25 per cent, and the remaining 13 per cent of softwoods consists of hemlock, cedar, and other minor species. Hardwoods comprise less than one-fourth of all the standing saw timber in New England. Most of this consists of birch, beech, and maple, which are estimated to comprise about 72 per cent of the total hardwood. Oak makes up 13 per cent, and the remaining 15 per cent consists of miscellaneous species.

Softwoods have been cut off much more generally than hardwoods. This is principally because softwoods have a wider commercial value, both for lumber and for the manufacture of paper. It is partly a matter of transportation also. Softwood logs and bolts can be floated readily down the streams to the mills, while it is difficult to float hardwood logs. There are extensive areas, particularly in the interior of Maine, where the softwood timber has been cut off and the hardwood timber remains standing. Much of this hardwood has been left uncut because of its remoteness from easy transportation.

In the absence of any recent complete survey of New England timber resources, it is difficult to determine the present stand in the individual States. The high variability in species and the general conditions of different areas make any rough estimate quite wide of the mark. The United States Forest Service in 1920 made an estimate of the saw timber and pulpwood in the six New England States, which is summarized by species in the following statement. About half of this lumber is of pulpwood species, consisting of spruce, fir, hemlock, and poplar.

	Million board feet
Softwoods:	
Spruce and fir	23, 971
White pine	9, 816
Cedar	2, 789
Hemlock	1, 804
Pitch pine	100
Total softwoods	38, 480
Hardwoods:	
Yellow birch	2, 933
Maple	2, 897
Beech	1, 635
Oak	1, 510
Paper birch	678
Poplar	374
Ash	215
Other hardwoods	1, 077
Total hardwoods	11, 319
Total hardwoods and softwoods	49, 799

TYPES OF TIMBERLAND

The forests of New England may be grouped into several large divisions or types, according to predominant species. These are the spruce-fir type, the mixed spruce and hardwood type, the northern hardwood type, the white-pine type, the paper-birch and aspen type, and the scrub-oak type. The spruce-fir type is confined chiefly to northern New England and is most common in northern Maine, New Hampshire, and Vermont. It extends down through the Green Mountains into western Massachusetts, where it is found in the higher elevations of the Berkshires. It occurs on widely varied topography, from practically flat land to some of the steepest slopes. The northern hardwoods, consisting of yellow birch, hard maple, and beech, occur in proportions varying from practically none to nearly pure hardwood stands. White pine, gray birch, and hemlock are of common occurrence throughout central New England. In the Cape Cod region of Massachusetts and in some other sections there is a type of forest frequently known as the scrub-oak type, which owes its existence almost entirely to repeated fires, which have destroyed all the better species.

In the early cuttings of the spruce-fir forests only the large spruce and white pine were cut, down to a breast-high diameter limit of 12 to 14 inches. This partial opening of the stand permitted increased growth of the remaining trees, so that a second cut was usually possible on the same area in about 20 years. This second cutting was ordinarily made to a lower diameter limit—approximately 10 inches breast-high dimension. The practice of utilizing pulpwood in recent years has led to increasingly heavy cuttings, which frequently remove all spruce and fir down to a breast-high diameter limit of 5 or 6 inches. Consequently it is probable that future stands of softwood on such areas will be of an approximately even age. Similar even-age stands also come on abandoned farm lands or windfalls and in some cases after fires.

LUMBER CONSUMPTION

The exploitation of the timber resources of New England has passed through a number of stages. Sawmill activities have been characteristic and important industries in the region from the earliest times. The first sawmill in the United States was erected in southern Maine in 1623. Cutting of the virgin white pine for lumber was the first extensive activity in New England forests. This reached its peak about 1840, and the virgin pine was practically all gone by 1870. Spruce lumber became important soon after 1840. This in turn gave way to the cutting of spruce and other softwood for pulp and paper manufacture, which commenced about 1890 and reached its greatest activity about 1910.

In recent years there has been a marked falling off in the production of spruce and fir lumber in New England, dropping from slightly more than 700 million board feet in 1915 to 228 million board feet in 1924. The cut of pine lumber between 1906 and 1909 was close to 1,000 million board feet, and it fell to between one-third and one-half of this amount from 1920 to 1924. There has been a similar drop in the production of hardwood lumber. This production amounted to between 400 and 500 million board feet from 1906 to 1909; from 1920 to 1924 it was between 150 and 250 million board feet. At the present time New England produces considerably less than one-half of the amount of lumber which the region consumes. Its total lumber cut in 1924 was 944 million board feet and its total consumption was 2,130 million.

The year of maximum production of New England lumber was 1907, when it amounted to 3,170 million board feet. The increased production at that time resulted from the introduction of portable sawmills, which made small scattered lots available, as well as from the increase in second-growth timber on farms that had reverted to forests. Increasing scarcity of better grades of lumber throughout the country caused an advance in prices which provided an attractive market for this product. The drain on the saw timber of this region in 1920 was estimated to be nearly three and one-half times as great as the replacement from the annual growth. The actual lumber production in 1918 was less than one-half as much as in 1907. The cut of softwood in this earlier year comprised 7.6 per cent of the softwood for the whole country; by 1918 it had fallen to 4.3 per cent.

Out of a total New England consumption of 2,130 million feet of lumber annually, about 1,250 million feet is shipped in from other regions. This includes, roughly, 500 million feet imported chiefly from Canada, 500 million shipped in from the South, and about 250 million from the far West. Under present economic conditions lumber can be transported by water from these distant virgin regions and laid down at New England ports at a lower cost than lumber of equivalent quality from near-by New England forests. Lumber shipped in from other sections has often been marketed at haphazard prices, in consequence of the financial pressure for the liquidation of stumpage holdings in the Western States. This situation, however, can not be considered a permanent one, since it is the outgrowth of temporary conditions that must change before many years.

FOREST PROTECTION AND MAINTENANCE

The particular problem of forestry in the northeastern United States is to maintain continuous production on forest land and to produce full crops of timber. More attention has been given to these objects in this region than in other forest areas of the country. It finds expression in (1) the care of forests by private holders, (2) protection against fire hazards, (3) measures for the control of disease and insects, (4) the acquisition of forest tracts by public agencies, and (5) efforts toward reforestation by holders of large tracts and by States and municipalities.

Most of the New England soil is well adapted to the growth of timber, and natural reforestation from the new growth takes place generally where fire is kept out. A fairly good reproduction of spruce and fir usually takes place to form the basis for a new stand of timber. A very large proportion of the New England forest land is now covered with growing timber which has not yet reached merchantable size. Throughout the white-pine region the forest is restored naturally. The large amount of natural young growth now coming on, especially in the pine regions, calls for intelligent and conservative utilization and the avoidance of premature cutting.

The new stands of timber that have followed cutting are not always composed of desirable species and sometimes are not of sufficient density. Such stands are not adequate to produce the highest yields of which the land is capable. Where timber cutting is not followed by fire, however, some kind of forest growth usually covers the cut-over lands within a reasonable time. Repeated careless cutting is likely to bring about steady deterioration by reversion to poor stands of inferior species.

PROTECTION FROM FIRE

To keep forest lands productive the first essential is fire control. A single fire in a cut-over area frequently results in converting it into a barren waste, and repeated fires are almost certain to do so. In the northeastern States nearly one-fourth of the total forest area has been destroyed by forest fires. Concerted efforts on the part of public agencies, private owners of timber, and the general public are necessary to remove the fire hazard as the first step toward putting timber growing on a safe basis.

Losses from fire in the principal forest regions of New England are held in check by organized detection and suppression forces with the cooperation of the Federal Government and the support of a strong traditional feeling of individual local responsibility. Although the present fire-control systems are generally well organized and are efficiently conducted, experts are of the opinion that the funds available are still inadequate to provide the full protection that is needed to make the forests commercially insurable risks.

Experience has shown that fire-control systems should center in a strong State department of forestry which has ample authority and funds to develop a State-wide organization for prevention and suppression of forest fires. In northern Maine the forestry district comprises some 10,000,000 acres and has been created by law; within this area the responsibility for all fire-control activities is centered in the State forester. Funds for this purpose are raised by special tax on all property within the district. In the unorganized towns of northern New Hampshire the State also assumes primary responsibility for all fire-control activities on privately owned lands.

The following table shows the average forest area burned annually in the individual States of the northeastern area from 1916 to 1923, inclusive, with the percentage relation to the total forest area.

Average Forest Area Burned Annually, 1916 to 1923, Inclusive

State	Area burned	Per cent of total forest area	State	Area burned	Per cent of total forest area
	Acres			*Acres*	
Maine	24, 997	0. 17	Connecticut	27, 581	1. 09
New Hampshire	4, 815	. 12	New York (Adirondacks)	11, 908	. 10
Vermont	1, 155	. 04	New Jersey	65, 759	3. 28
Massachusetts	16, 824	. 75	Pennsylvania	171, 479	1. 43
Rhode Island	3, 537	1. 26			

It is observed that the loss from fire is exceedingly low in Vermont. It is also low in New Hampshire and Maine. Authorities hold that an adequate fire-protective system should keep the area burned each year within one-tenth of 1 per cent of the total forest area. These latter two New England States are slightly above this point. Massachusetts is materially above it, and in Connecticut and Rhode Island the percentages are the highest in New England. The highest proportion of forest area burned is in the more thickly settled portions near the industrial centers.

PROTECTION FROM OTHER ENEMIES

The ravages of disease and insects, particularly the white-pine blister rust, the white-pine weevil, the spruce bud worm, and the gypsy moth, have made necessary the employment of strong measures to control these enemies of forest growth. In some sections of New England they have worked considerable damage, but effective efforts are being made to hold them in check and to prevent their spread to uninfested areas.

FOREST PLANTING

Nearly 80,000 acres of New England land had been planted to forest by private agencies up to the end of 1925. The greater portion of these plantings was made by private individuals and industrial organizations, and States. One-half the total New England plantings was in Massachusetts, upward of one-seventh in Connecticut, about one-eighth in Maine, approximately one-ninth each in

Vermont and New Hampshire, and a small amount in Rhode Island. Although the extent of forest plantings at the present time is not great in proportion to the area of New England land that could be devoted to productive forestry, the movement is going forward with increasing interest. These plantings are important as demonstrations of the results of forestry management, and as a means for a positive attitude toward forestry among private landowners.

The area of the forest plantings in each State by various agencies is shown in the following table. Considerable attention has been given recently to the establishment of town and community forests.

FOREST PLANTING IN NEW ENGLAND STATES TO END OF 1925

Agency	Maine	New Hampshire	Massachusetts	Connecticut	Vermont	Rhode Island	New England total
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Individuals	500	3, 800	14, 000	4, 060	4, 474	340	27, 174
Industrial organizations	9, 500	2, 500	4, 000	4, 850	1, 605		22, 455
States		1, 200	18, 000	1, 100	1, 900		22, 200
Municipalities		1, 200	4, 000	1, 220	826		7, 246
Schools, colleges, and other		100		30	489	60	679
United States Forest Service		43					43
Total	10, 000	8, 843	40, 000	11, 260	9, 294	400	79, 597

The species most largely planted are white pine, Norway pine, and spruce. Seedlings are obtained from the State forestry departments, which maintain nurseries and sell, at small cost, young trees for private planting. Some of the larger owners of timberland maintain their own nurseries to provide stock for planting cut-over lands.

A limited amount of stock for planting is now provided by the State nurseries. The reforesting of New England's timberland on any extensive scale requires cheap planting stock available to farmers, and other landowners, at a cost sufficiently low to justify the outlay. Cooperation, in a limited way, by the Federal Government is given under the provision of the Clark-McNary Act, but a greatly increased volume of available planting material is needed to support a justifiable policy of forest expansion in the several States.

LOCAL FORESTRY ORGANIZATIONS

In addition to forestry departments with foresters maintained in each of the New England States, there are a number of other agencies which are doing much to promote constructive forestry in New England. The United States Government maintains the Northeastern Forest Experiment Station at Amherst, Mass., whose field, in addition to New England, includes New York. The Harvard Forest, at Petersham, Mass., is devoted to the study and application of practical forestry methods in New England. Schools of forestry are maintained also at Yale University, at the University of Maine, and at the University of New Hampshire.

There are also strong State forestry associations in New Hampshire, Vermont, Massachusetts, and Connecticut. The Society for the Protection of New Hampshire Forests has purchased for public use several tracts of forests in the White Mountains and elsewhere.

The Connecticut Forestry Association has been active in raising money to purchase forests for presentation to the State. In Maine, Bates College owns large tracts of forest land. In Vermont Middlebury College is practicing forestry on its Battell Forest tract.

OWNERSHIP OF FOREST LAND

About 90 per cent of the forest lands of New England are privately owned. The woodlands on privately owned farms in New England, including natural or planted woodlands and cut-over lands with young growth, in 1925 amounted to 7,300,000 acres. This is nearly one-half the total farm area in the six States, and exceeds the acreage of improved farm land.

PUBLIC HOLDINGS

Upward of 1,000,000 acres of New England forest lands are owned by public agencies. More than four-fifths of this is in the three northern States, and one-half of this northern portion is represented by the White Mountain National Forest, in New Hampshire and Maine, whose total area is being increased, by purchases, up to an ultimate limit of 1,000,000 acres. The principal holdings of State-owned land are in Maine, but most of these are not in productive forests. In the extent of actual State forests, Massachusetts leads, with 97,000 acres so designated, in addition to 12,000 acres of park lands and 48,000 acres in other nonforest land. The State forests of Vermont comprise 30,500 acres, those of New Hampshire about 20,500, and those of Connecticut 20,000 acres.

Besides the State and National holdings of forest land, various municipalities and counties have set aside upward of 85,000 acres in forest tracts. The greater portion of this is in Massachusetts, but very considerable acreages have been set aside by Connecticut, New Hampshire, and Vermont. The following table shows the acreage of forest land owned by the different public agencies in each of the New England States at the end of 1925.

Publicly Owned Lands in New England States, December 31, 1925

Ownership	Maine	New Hampshire	Massachusetts	Connecticut	Vermont	Rhode Island	New England
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
National forests	32, 256	408, 949	--------	--------	--------	--------	441, 205
State forests	100	20, 538	97, 000	20, 000	30, 504	--------	168, 142
Other State land	330, 000	575	48, 000	2, 000	713	--------	381, 288
State parks	25	--------	12, 000	7, 000	160	--------	19, 185
Municipal and county forests and parks	835	10, 612	52, 603	15, 543	5, 963	104	85, 660
Total public lands	363, 216	440, 674	209, 603	44, 543	37, 340	104	1, 095, 480

FORESTRY POLICIES

The fullest development and utilization of the forest resources of New England require a long-time coordinated policy based upon a comprehensive study of its forest land and of the wood resources, from the standpoint of potential production and utilization, with a program for developing permanent industries of the sort that will utilize the products of the forest most profitably. In particular, the development of industries using the hardwoods of northern New England could be extended to provide a profitable immediate market for forest products. Recent efforts have been directed to the bringing about of a common point of view between commercial interests and the forest owners, aiming at the setting up of a constructive common program that will conserve the future development of the New England forests, and will at the same time provide for their present commercial utilization. Education of the farmer in the practice of forestry on his wood lots is of vital importance in an adequate forestry program.

Taxation of forest lands is one of the most baffling problems. The long period of time during which a growing forest provides no money return makes existing tax policies unsuitable, and discourages the establishment of forestry on a commercial basis. In this field the method of paying the tax is more important than the amount. The return from taxation can be maintained by a graduated system based on yield rather than by a uniform tax paid each year. Much of the premature cutting of New England timber stands has been forced upon the owners by the present annual tax requirements. This reduces not only the yield but the quality of the timber. The tax burden is serious in the maintenance of cut-over lands.

The United States Forest Service has been engaged for some time in special research to determine the proper basis for taxing forest land. The results of its work should be of value as a guide in fixing constructive taxation policies. Certain of the New England States have been giving special attention to the revision of their tax laws as applied to forest holdings. The effective working out of these policies is needed to put New England forestry on a sound permanent basis in line with other productive enterprises.

MINERAL RESOURCES [1]

New England makes a substantial contribution [2] to the national output of certain important minerals, although the value of its total mineral production appears insignificant in comparison with the great ore and fuel producing districts of the United States. New England contributes approximately 1 per cent of the value of the total mineral production of the country. There are none of the important fuel minerals (see p. 115) of commercial importance in the region—no coal, oil, or natural gas—although a considerable area in Rhode Island and southeastern Massachusetts contains some low-grade anthracite, which has been mined to a slight extent. Neither does this region possess deposits of iron or other metals of commercial importance. In the early history of the country shallow mines were operated for the extraction of iron, copper, lead, gold, and silver, in different parts of New England, and there has been an occasional small output of copper and zinc in recent years. For its supply of the important metallic and fuel minerals New England is now wholly dependent upon other sections.

The highly complex and diverse geologic structure of New England contains a great variety of mineral deposits, but few of these are commercially important. In more recent times mining operations have been carried on for mica, feldspar, talc, graphite, asbestos, and semiprecious gems, in addition to the commercial rock products—granite, marble, limestone, and slate. These rock products are the important commercial minerals of the New England section.

VALUE OF MINERAL PRODUCTION

The mineral production of New England in 1925 represented, in terms of value, 50.7 per cent of the national output of mica, 46.1 per cent of the feldspar, 44.9 per cent of the granite, 38.4 per cent of the marble, 36.3 per cent of the slate, 26.5 per cent of the talc, 20.7 per cent of the trap rock, 12.7 per cent of the lime, and about 10 per cent of the mineral water of the United States. The production of feldspar and of talc each had a value exceeding $500,000, and that of mica more than $250,000. Other miscellaneous products, including silica, fuller's earth, whetstones, and other minerals, comprised an additional $750,000.

The value of the total mineral production of this region, as reported by the Bureau of Mines for 1927, exceeded $48,500,000. Production of stone comprises about three-fourths of this total. The remainder is made up almost wholly of clay and clay products, lime, sand, and gravel. In the total mineral production of New England in 1927, Massachusetts and Vermont together contributed nearly two-thirds (Massachusetts 33.6 per cent, Vermont 30.3 per cent). The order of the other States was Connecticut, 15 per cent; Maine, 11.3

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[1] Acknowledgment is made to the Bureau of Mines for statistics used in this section.

[2] See also "Stone and Earth Manufactures" in section on manufactures, p. 515 of this report.

per cent; New Hampshire, 7.1 per cent; Rhode Island, 2.7 per cent. The three States of northern New England contributed not quite one-half (48.7 per cent) of the total, and the three southern States slightly more than one-half (51.3 per cent).

PRODUCTION BY STATES

The annual production and value of minerals in each of the six States, as reported by the Bureau of Mines for 1925, 1926, and 1927, are shown in the following tables.

MINERAL PRODUCTION OF MASSACHUSETTS, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Briquets, fuel .... short tons	----------	----------	----------	----------	(1 2)	(1 2)
Clay products	----------	[3] $3,789,164	----------	[3] $3,971,586	----------	[3 4] $2,398,474
Clay, raw .... short tons	2,270	[2] 31,538	1,950	[2] 28,973	1,626	[2] 23,240
Coke .... do	535,302	(1 2)	573,748	(1 2)	744,091	[2] 6,008,556
Fuller's earth .... do	(1)	(1)	(1)	(1)	(1)	(1)
Iron, pig .... long tons	----------	----------	23,130	(1 2)	129,039	(1 2)
Lime .... short tons	197,732	2,610,279	202,065	2,653,746	189,343	2,325,031
Manganese ore .... long tons	(1)	(1)	----------	----------	----------	----------
Manganiferous ore .... do	(1)	(1)	(1)	(1)	(1)	(1)
Mineral waters .... gallons sold	(5)	(5)	(5)	(5)	(5)	(5)
Sand and gravel .... short tons	3,349,091	3,116,323	2,969,172	3,276,787	2,646,335	2,495,696
Sand-lime brick .... thousands	(1 3)	(1 3)	(1 3)	(1 3)	(1 3)	(1 3)
Silica (quartz) .... short tons	(1)	(1)	(1)	(1)	(1)	(1)
Stone .... do	[6] 2,209,560	[6] 6,640,333	[6] 2,089,340	[6] 6,216,793	[6] 2,629,890	[6] 7,291,969
Miscellaneous [7]	----------	5,443,850	----------	6,284,324	----------	4,343,124
Total value, eliminating duplications	----------	16,831,529	----------	16,786,577	----------	16,295,373

[1] Value included under "Miscellaneous."
[2] Value not included in total value for State.
[3] Figures obtained through cooperation with Bureau of the Census.
[4] Exclusive of pottery, value for which is included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of sandstone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "1," "4," and "6" above.

MINERAL PRODUCTION OF VERMONT, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay products	----------	[1] $98,564	----------	(1 2)	----------	(1 2)
Clay, raw .... short tons	1,733	[3] 9,444	2,027	[3] $11,364	(2 3)	(2 3)
Copper .... pounds	----------	----------	473,200	66,248	208,224	$27,278
Gold .... troy ounces	----------	----------	2	41	----------	----------
Lime .... short tons	66,245	788,936	56,378	677,944	61,024	683,440
Mineral waters .... gallons sold	(4)	(4)	(4)	(4)	(4)	(4)
Ore (copper) .... short tons	----------	----------	14,970	(5)	4,363	(5)
Sand and gravel .... do	192,227	35,608	141,554	25,535	171,250	39,143
Scythestones .... do	(2)	(2)	(2)	(2)	(2)	(2)
Silver .... troy ounces	----------	----------	1,965	1,227	821	465
Slate	----------	3,963,025	----------	4,267,041	----------	4,108,911
Stone .... short tons	[6] 283,030	[6] 8,958,846	330,230	9,244,465	321,970	9,216,116
Talc .... do	54,883	533,603	53,510	514,527	54,688	503,716
Miscellaneous [7]	----------	30,351	----------	158,133	----------	136,872
Total value, eliminating duplications	----------	14,408,933	----------	14,955,161	----------	14,702,891

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value included under "Miscellaneous."
[3] Value not included in total value for State.
[4] No canvass.
[5] Not valued as ore; value of recoverable metal content included under the metals.
[6] Exclusive of sandstone, value for which is included under "Miscellaneous."
[7] Includes minerals indicated by "2" and "6" above.

MINERAL PRODUCTION OF CONNECTICUT, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay products		[1, 2] $2,509,727		[1, 2] $3,291,298		[1, 2] $2,652,640
Clay, raw ... short tons	416	[3] 6, 503	794	[3] 9, 491	621	[3] 6, 225
Feldspar (crude) ... long tons	10, 426	71, 201	11, 436	87, 844	6, 123	43, 319
Lime ... short tons	58, 449	672, 821	61, 742	695, 495	53, 304	608. 550
Mica:						
Scrap ... do	(4)	(4)			(4)	(4)
Sheet ... pounds	(4)	(4)	(4)	(4)	(4)	(4)
Mineral waters ... gallons sold	(5)	(5)	(5)	(5)	(5)	(5)
Sand and gravel ... short tons	1, 065, 132	463, 807	1, 059, 556	451, 069	667, 983	485, 169
Sand-lime brick ... thousands	(1 4)	(1 4)	(1 4)	(1 4)	(1 4)	(1 4)
Silica (quartz) ... short tons	595	3, 960	246	1, 678		
Stone ... do	1, 830, 210	2, 655, 339	[6] 2, 069, 920	[6] 2, 680, 849	2, 295, 360	3, 202, 040
Miscellaneous [7]		378, 599		487, 108		307, 382
Total value, eliminating duplications		6, 755, 454		7, 695, 341		7, 299, 100

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Exclusive of pottery, value for which is included under "Miscellaneous."
[3] Value not included in total value for State.
[4] Value included under "Miscellaneous."
[5] No canvass.
[6] Exclusive of limestone, value for which is included under "Miscellaneous."
[7] Includes mineral indicated by "2", "4", and "6" above.

MINERAL PRODUCTION OF MAINE, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay products		[1] $625, 969		(1 2)		[1] $680, 739
Clay, raw ... short tons	(2 3)	(2 3)	(2 3)	(2 3)	266	[3] 3, 392
Feldspar (crude) ... long tons	28, 404	256, 731	33, 897	$306, 695	34, 328	299, 386
Gems and precious stones		(4)		(4)		(4)
Lime ... short tons	115, 571	1, 291, 812	128, 120	1, 615, 776	116, 566	1, 230, 356
Lithium minerals ... do					(2)	(2)
Marl, calcareous ... do			(2)	(2)	500	4, 250
Mica:						
Scrap ... do	(2)	(2)			(2)	(2)
Sheet ... pounds	(2)	(2)			(2)	(2)
Mineral waters ... gallons sold	(4)	(4)	(4)	(4)	(4)	(4)
Peat ... short tons	(2)	(2)			(4)	(4)
Sand and gravel ... do	407, 760	155, 014	491, 260	220, 931	584, 395	251, 448
Silica (quartz) ... do	(2)	(2)	328	1, 050	(2)	(2)
Slate		604, 062		662, 184		549, 952
Stone ... short tons	[5] 361, 570	[5] 2, 870, 442	311, 830	2, 360, 593	355, 800	2, 447, 644
Miscellaneous [6]		38, 942		622, 294		11, 920
Total value, eliminating duplications		5, 838, 718		5, 785, 619		5, 695, 000

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value included under "Miscellaneous."
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "2" and "5" above.

MINERAL PRODUCTION OF NEW HAMPSHIRE, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay products		[1] $828, 541		[1] $881, 997		[1] $811, 626
Diatomite short tons	2	100	2	130	7	455
Feldspar (crude) long tons	38, 366	278, 736	33, 271	287, 596	27, 449	223, 077
Garnet, abrasive short tons	(2)	(2)	(2)	(2)	(2)	(2)
Mica:						
Scrap do	1, 953	47, 525	1, 738	38, 213	1, 284	22, 909
Sheet pounds	1, 120, 857	198, 858	1, 371, 890	235, 890	720, 219	78, 849
Millstones		2, 908		3, 563		1, 025
Mineral waters gallons sold	(3)	(3)	(3)	(3)	(3)	(3)
Sand and gravel short tons	424, 330	316, 248	708, 098	731, 639	863, 618	653, 214
Scythestones do	(2)	(2)	(2)	(2)	(2)	(2)
Silica (quartz) do	(2)	(2)	277	1, 053	(2)	(2)
Stone do	[4] 130, 120	[4] 1, 712, 138	148, 250	1, 908, 284	[4] 178, 300	[4] 1, 584, 262
Miscellaneous [5]		79, 783		56, 280		71, 688
Total value, eliminating duplications		3, 464, 837		4, 144, 645		3, 447, 000

[1] Figures obtained through cooperation with Bureau of the Census.
[2] Value included under "Miscellaneous."
[3] No canvass.
[4] Exclusive of unclassified stone, value for which is included under "Miscellaneous."
[5] Includes minerals indicated by "2" and "4" above.

MINERAL PRODUCTION OF RHODE ISLAND, 1925–1927

Product	1925		1926		1927	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay products		(1 2)		(1 2)		(1 2)
Coke short tons	(1 3)	(1 3)	(1 3)	(1 3)	(1 3)	(1 3)
Graphite, amorphous do	(1)	(1)	(1)	(1)	(1)	(1)
Lime do	(1)	(1)	2, 857	$42, 535	2, 937	$43, 342
Mineral waters gallons sold	(4)	(4)	(4)	(4)	(4)	(4)
Sand and gravel short tons	131, 535	$45, 157	381, 856	90, 538	271, 065	303, 639
Stone do	[5] 153, 230	[5] 724, 428	[5] 252, 280	[5] 895, 718	[5] 153, 400	[5] 734, 164
Miscellaneous [6]		1, 803, 150		1, 446, 495		1, 360, 219
Total value, eliminating duplications		1, 151, 857		1, 339, 398		1, 311, 000

[1] Value included under "Miscellaneous."
[2] Figures obtained through cooperation with Bureau of the Census.
[3] Value not included in total value for State.
[4] No canvass.
[5] Exclusive of limestone, value for which is included under "Miscellaneous."
[6] Includes minerals indicated by "1" and "5" above.

STONE PRODUCTION

Although most of the stone industries of New England are concentrated in a few localities, yet they are of considerable importance in certain areas within each State. The greater part of the New England stone industry is in the interior of the region. Large quantities of stone, however, are quarried along the coast of Maine; on the Massachusetts coast at Cape Ann, Quincy, and New Bedford; on the coast of Rhode Island at Westerly; and along the Sound in Connecticut. These tidewater quarries have a particular advantage in cheap and easy water transportation to points along the Atlantic and Gulf coasts.

GRANITE

Granite is the most widely distributed of the New England minerals which have any commercial importance. Massachusetts now slightly surpasses Vermont in value of production, which is followed in order by Maine and New Hampshire. There are important quarries also in Rhode Island and Connecticut. In Massachusetts, with minor exceptions, the granite quarries lie in the eastern portion of the State, principally along the coast from New Bedford to Cape Ann. The granite quarries of Vermont are located in the eastern half of the State, extending from the Canadian line to Brattleboro. In Maine they are concentrated along the coast and on the adjacent islands, with a few quarries as far as 55 miles inland. In New Hampshire the granite quarries are located on the slopes of the White Mountains and also about Concord and near the State boundaries of Vermont and Massachusetts. Almost all the quarries in Rhode Island are along the Sound, extending westward to the State line. In the State of Connecticut the quarries are principally along the coast, a few border Rhode Island, and others are located in the western part of the State and along the Connecticut River.

MARBLE

The leading marble deposits of New England are concentrated in Vermont, west of the Green Mountains, in Bennington, Rutland, Crittenden, and Addison Counties; and also at Swanton, in Franklin County, and on Isle la Motte, in Grand Isle County. Less important deposits are located on the east side of the Green Mountains, in Washington and Orange Counties. In Massachusetts there are marble deposits in Berkshire and Hampden Counties, but the marble quarried in this State represents a very small portion of the New England total. There are marble deposits also in Litchfield County, Conn., which are not significant in the present production.

SLATE

New England production of slate comprises an important part of the United States total. The output of Vermont and Maine in 1926 together constituted 36 per cent of the value of the national product and amounted to nearly $5,000,000. The Vermont slate deposits appear in four distinct districts. The most important district, which furnishes the well-known purple slates, extends for a distance of 26 miles along the New York State line southeast from the town of Sudbury, in Rutland County, to Rupert, in Bennington County. Another district extends northward along the Connecticut River for more than two-thirds the length of the State; while the third extends from the Canadian line to about the middle of the State, along the east flank of the Green Mountains. The fourth district, which is as yet undeveloped, covers only 2 or 3 square miles near Lake Champlain, in the township of Benson, in Rutland County. The slate now produced in Maine comes from Monson, in Piscataquis County.

LIMESTONE AND LIME

Limestone deposits occur in each of the New England States except New Hampshire, and the production of lime is an important industry in certain sections, particularly in western Massachusetts and along the Maine coast. The limestone belt of western Massachusetts extends northward into western Vermont and southeastward into Connecticut. In some localities the deposits are made up of calcitic limestone and in others of dolomitic or magnesium limestone. There are other deposits in Worcester and Middlesex Counties of Massachusetts and also in Providence County in Rhode Island. The principal limestone deposits of Maine are in Knox County, with Rockland as the principal center of commercial production. The important lime-producing sections in Massachusetts are in Berkshire County; in Maine, Knox County; in Vermont, Addison, Chittenden, Franklin, Rutland, and Windsor Counties; in Connecticut, Fairfield and Litchfield Counties; and in Rhode Island, Providence County.

CLAY, SAND, AND GRAVEL

Clay.—Deposits of clay occur in all the New England States. In Massachusetts they occur in all parts of the State; clay suitable for making fire brick is found in Bristol and Duke Counties. In Connecticut there are abundant supplies, with clay suitable for making fire brick in Litchfield County and kaolin for porcelain in Fairfield, Hartford, and Litchfield Counties. Rhode Island has clay deposits in Bristol and Providence Counties and pottery clay in Newport County. Clay deposits occur in all sections of Maine. New Hampshire has clay deposits in most parts of the State, with pottery clay obtainable in Cheshire County. In Vermont clay suitable for fire brick occurs in Rutland County and kaolin in Addison, Bennington, and Rutland Counties.

Sand and gravel.—Supplies of sand and gravel suitable for building and other purposes occur generally throughout New England in adequate quantities for all local requirements.

FELDSPAR

Feldspar is an important mineral in the manufacture of pottery, chinaware, porcelain, enamel ware, and enameled brick and tile. Nearly half the crude feldspar produced in the United States in 1925 came from New England. North Carolina is the leading single State; New Hampshire ranks second, Maine, third, and Connecticut fifth. The value of this product from the three New England States in 1925 was $607,000, and this value was exceeded considerably by the production of the following year. The granite pegmatites, in which occur deposits of feldspar, quartz, mica, and gem minerals, occur in New England in a belt extending northward through Connecticut, Massachusetts, New Hampshire, and southwestern Maine. The general color of granite is determined by the color of the feldspar which it contains. Connecticut has important feldspar deposits extending south and west of Hartford for about 20 miles in Middlesex and Hartford Counties. In New Hampshire the important sources of high-grade feldspar are the mica mines north of Keene, in Cheshire County. Most of the feldspar deposits in Maine are relatively near the coast, in Androscoggin, Oxford, and Sagadahoc Counties.

MICA

The production of mica muscovite in New England is confined principally to New Hampshire, although Connecticut and Maine produce small amounts. Nearly all the mica produced in the United States comes from New Hampshire and North Carolina. North Carolina at present surpasses New Hampshire in quantity produced and in some years has led in the value of the product, but since 1924 New Hampshire has held leadership in value. The total reported New England production in 1925 had a value of approximately $250,000. In that year New Hampshire contributed 62 per cent of the total domestic sheet-mica production of the United States, and in 1924, 51 per cent. The value showed substantial increase in 1926. The most important mica deposits in New Hampshire lie in the belt extending northward from Keene through the middle of Cheshire County into Sullivan County, and from the northwestern part of Merrimack County northeast to about the center of Grafton County. Mining operations were begun in New Hampshire in 1803, and this was the only producing State until 1868, when the North Carolina deposits were opened. Since that time North Carolina has held the leadership in quantity produced.

The principal uses of New England mica are in the electrical industries; in the glazing of stoves and furnaces, for lamp chimneys, and for diaphragms in phonographic and similar instruments. Ground mica finds use in the preparation of roofing, as a decorative material for wall paper and other decorations, in the making of special paints, and, occasionally, as a facing for concrete to simulate granite. Finely ground mica is used in lubricants and as a rubber filler.

TALC

Vermont is the only New England State producing large quantities of talc and soapstone. Mining of these began over a century ago, but grinding of talc did not commence until about 1902; since that time, up to 1921, there was a gradual increase in production. This State held the leadership of the United States in quantity produced from 1917 through 1923. Prior to 1917 and since 1923 New York has ranked first in quantity. Because of the higher grade of the product of New York, that State has always held the leadership in the value of product. Vermont was the second largest producer of talc in 1925 and 1926, the total value of its product in 1925 being upward of $533,000 and representing 26.5 per cent of the total value for the United States. There was some falling off in value in the following year.

The largest known talc reserves of any producing State in the Union are said to be in Vermont. In this State one company has blocked out with diamond drills reserves exceeding 2,800,000 tons, and another company in a published report estimates that it has reserves of about 4,250,000 tons. The present talc-producing centers of Vermont are at Johnson, in Lamoille County; at Rochester and near Chester, in Windsor County; at east Granville, in Addison County; at Waterbury, in Washington County; and at Windham, in Windham County. Soapstone is produced only at Chester.

The greater part of the talc produced in Vermont is sold for use as a filler in the manufacture of paper goods. A portion is used in making prepared roofing, rubber tires and other rubber products, as a lubricant in oils and greases and for foundry facings, also in fire clay products, and in making twine and cordage. Vermont talc is used to some extent in the manufacture of paint and of wall plaster, and in the finishing of textiles.

OTHER PRODUCTS

Asbestos.—Deposits of asbestos occur in the vicinity of Belvidere Mountain in Vermont. These appear to be a southern extension of the asbestos area in Quebec. The production of asbestos, however, has never become commercially important anywhere in New England.

Graphite.—Natural graphite, whose chief uses are in the manufacture of foundry facings, pigments and paints, crucibles, pencils and crayons, and commutator brushes, is produced in Rhode Island by one of the few establishments in the entire United States engaged in this line of manufacture. The deposits are not large, and they occur with the deposits of graphitic coal. Production of amorphous graphite was reported in 1925 from Rhode Island, Michigan, and Nevada, in which Rhode Island was the principal producer.

Abrasives.—In the production of natural abrasive materials New England contributes whetstones, millstones, and garnet. While these do not make up an imposing total, yet in the production of garnet, which has important industrial uses in the finishing of glass, Merrimack County, N. H., contributed, with Warren County, N. Y., to a total value of $713,000.

Peat.—Numerous deposits of peat occur in swamps throughout New England, particularly in the eastern and central parts of Massachusetts, in eastern Maine, in the northern part of New Hampshire, and in the Champlain Valley of Vermont. These peat deposits at present have little commercial importance, but they are potential sources of material for fuel or for industrial uses.

Mineral waters.—The production of mineral waters in New England (exclusive of Vermont) in 1923, the latest date for which figures are available, had a value of $628,000, representing 9.7 per cent of the United States total. This was a substantial increase over the New England total (exclusive of New Hampshire) for 1920, which was $513,000, representing 10.5 per cent of the United States total. In 1920 Maine contributed about 59 per cent of the total value of New England production, although Massachusetts and Connecticut together contributed 68 per cent of the total quantity.

FISHERIES

NOTE.—Most of the section on Fisheries was prepared by O. E. Sette, of the Bureau of Fisheries.

The fishing industries possess an importance for New England beyond that of the mere wealth invested or the annual income which results to-day from this activity. Fishing was the earliest form of New England industry. It was an important factor in establishing the economic life of the early settlers, and was the basis for building the extensive ocean commercial life of New England in the last century, which, in turn, was the foundation of its present industrial life.

The fisheries, together with the related wholesale trade in fishery products and the industries of fish canning and preserving, in 1924 gave employment to 24,513 persons. Of this number 15,983 were fishermen, 6,608 were engaged in canning and preserving, and 1,922 were employed in the wholesale fish trade. The product of the fisheries proper in that year exceeded 406,822,000 pounds, valued at $18,818,000. Compared with the total of the United States (exclusive of Alaska) this is about 15 per cent of the persons engaged in the industry and about 20 per cent of the value of the fish catch. New England thus makes a substantial contribution to the protein food supply of the country. In this the section compares favorably with other geographical sections of like size, as may be seen in the next table. The output of New England surpasses in value that of any other section except the Pacific Coast States.

The fish industry of New England affords a market for large quantities of salt, ice, gasoline and oil, rubber clothing, nets, lines and cordage, paint and various vessel supplies, and shipping containers and packing cases. The canneries use many cans, large quantities of cottonseed and olive oil, and considerable quantities of parchment paper for wrapping the fish.

Moreover, New England is almost the sole domestic source of some of our best-known staple food fish. This group of States produces 91 per cent of the total United States cod catch, practically all the haddock, 86 per cent of the mackerel, 98 per cent of the swordfish, 87 per cent of the lobsters, and considerable, though smaller, percentages of other important sea foods.

Statistical Summary of Fisheries of the United States

Section	Persons engaged [1]	Products [2]	
		Quantity	Value
		Thousands of pounds	*Thousands of dollars*
New England States (1924)	24, 513	406, 822	18, 818
Middle Atlantic States (1926)	14, 335	168, 012	12, 456
Chesapeake States (1925)	39, 091	333, 206	13, 948
South Atlantic States (1927)	14, 805	260, 669	5, 696
Gulf States (1927)	20, 784	200, 072	10, 167
Pacific Coast States (1927)	[3] 22, 270	651, 197	22, 306
Mississippi River division (1922)	19, 122	105, 734	4, 504
Lake States (1927)	[3] 8, 162	[4] 87, 659	7, 032
Total	163, 082	2, 213, 371	94, 927

[1] Includes fishermen and persons employed on transporters, those in the wholesale fish trade, and in the fish canning and preserving industries.

[2] Includes products of the fisheries only.

[3] Statistics of 1922.

[4] Figures are for 1927 except those for shellfish, etc., which are for 1922.

Source: U. S. Bureau of Fisheries.

Lying in the region which includes the richest fisheries in the world, New England, situated just above the fortieth parallel of north latitude, has all the essentials for a prosperous fishing industry. In addition, the broken coast line provides harbors for the fishermen and favorable waters for fish and fishing. Moreover, the New England fisheries are not limited to the coast line. The ocean floor slopes so gently from the shores that there are extensive areas of relatively shallow waters far from the coast line itself. These shallows—mostly less than 60 fathoms, or 360 feet deep—are, without exception, good fishing grounds.

PRINCIPAL FISHING AREAS

There are over 20 of these "fishing banks" varying from 40 to 36,000 square miles in area and affording over 63,000 square miles of fishing grounds in addition to the waters immediately along the coast. While the fishermen reach all these banks, as well as the waters of the Gulf of St. Lawrence and the Newfoundland coast, and the waters south to the Carolinas, by far the greatest portion of the catch is taken within a sailing distance of about 200 miles from New England ports. The location of the banks is shown in Figure 3, and their relative productiveness and the principal species are shown in Figure 4.

PRINCIPAL FISHING GROUNDS IN THE NORTH ATLANTIC OCEAN

Name	Locality	Approximate area	Depth of water	Catch by American vessels, 1927	Principal species
		Square miles	*Fathoms*	*Thousands of pounds*	
Grand Bank	Southeast of Newfoundland.	36,000	25–60	1,128	Most important fishing ground in the world; principal fish, cod, hake, halibut, and cusk.
Green Bank	Between Grand and St. Pierre.	1,450	33–60	188	Feeding ground in winter; chiefly a halibut ground.
St. Pierre Bank	Off center of southern coast of Newfoundland.	4,800	22–53	750	An important halibut ground; few cod.
Gulf of St. Lawrence.	----------	----------	(1)	63	Ground of value and importance; cod, haddock, and mackerel.
Misaine Bank	Northward of the western two-thirds of Banquereau.	1,700	40–60	----------	Cod and other fish less abundant than in near-by regions; cod, haddock, hake, cusk, pollock, and halibut.
Banquereau	----------	3,000	16–50	1,646	One of the most important grounds; cod, hake, and cusk.
Canso Bank	Southeast of Cape Canso.	425	30–60	----------	Cod, haddock, hake, cusk, and pollock.
The Gully	Between Banquereau and Sable Island.	1,200	66–145	69	Chiefly a halibut ground.
Western Bank	----------	6,320	10–80	8,163	One of the most important of the western Atlantic; cod, haddock, pollock, cusk, hake, and halibut.
LeHave Bank [2]	Northeastward of Browns Bank.	2,365	46–85	7,097	Cod, haddock, and halibut, principal fish; hake, cusk, and pollock.
Roseway Bank	Northward of western part of LeHave Bank.	175	31–48	39	Cod, haddock, and cusk principal fish; hake, pollock, and halibut.
German Bank	Westward from Cape Sable.	----------	65–100	----------	One of the most important in the Bay of Fundy; mainly cod, hake, cusk, and haddock; few halibut and pollock.
Seal Island Ground	Northward of Browns Bank.	1,250	15–70	97	Mainly cod, haddock, and pollock; halibut, cusk, and hake; occasionally herring and mackerel.
Browns Bank	Northeast of Georges Bank.	1,375	20–75	12,192	Cod, haddock, pollock, hake, and halibut.
Jeffreys Ledge	Northeast from Cape Ann.	----------	27–35	6,383	Cod, haddock, hake, pollock, cusk, halibut, and macherel.
Cashes Bank	East from Cape Ann.	140	15–85	1,056	Cod, haddock, hake, cusk mostly; pollock and mackerel.
Fippenies Bank	do.	40	36–75	215	Cod, hake, pollock, and cusk; few haddock.
Platts Bank	Northeast from Cape Ann.	50	29–65	1,252	Cod, haddock, hake, pollock, and cusk; few halibut.
Stellwagen Bank	Between Cape Ann and Cape Cod.	85	12–25	1,836	Cod, haddock, hake, pollock, cusk, and mackerel.
Georges Bank	Eastward of Cape Cod and Nantucket Shoals.	8,500	2–50	38,923	Largest, and second in importance only to Grand Banks; cod, haddock, hake, halibut, cusk, and pollock; few mackerel.
South Channel	Between Nantucket Shoals and Georges Bank.	1,300	20–75	121,700	The most important haddock grounds; cod, hake, pollock, cusk, and halibut.
Nantucket Shoals	East to south of Nantucket Island.	1,200	3–25	8,477	Cod, haddock, pollock, hake, and mackerel.
Shore, general	----------	----------	----------	56,754	Herring, mackerel, flounders, and miscellaneous.

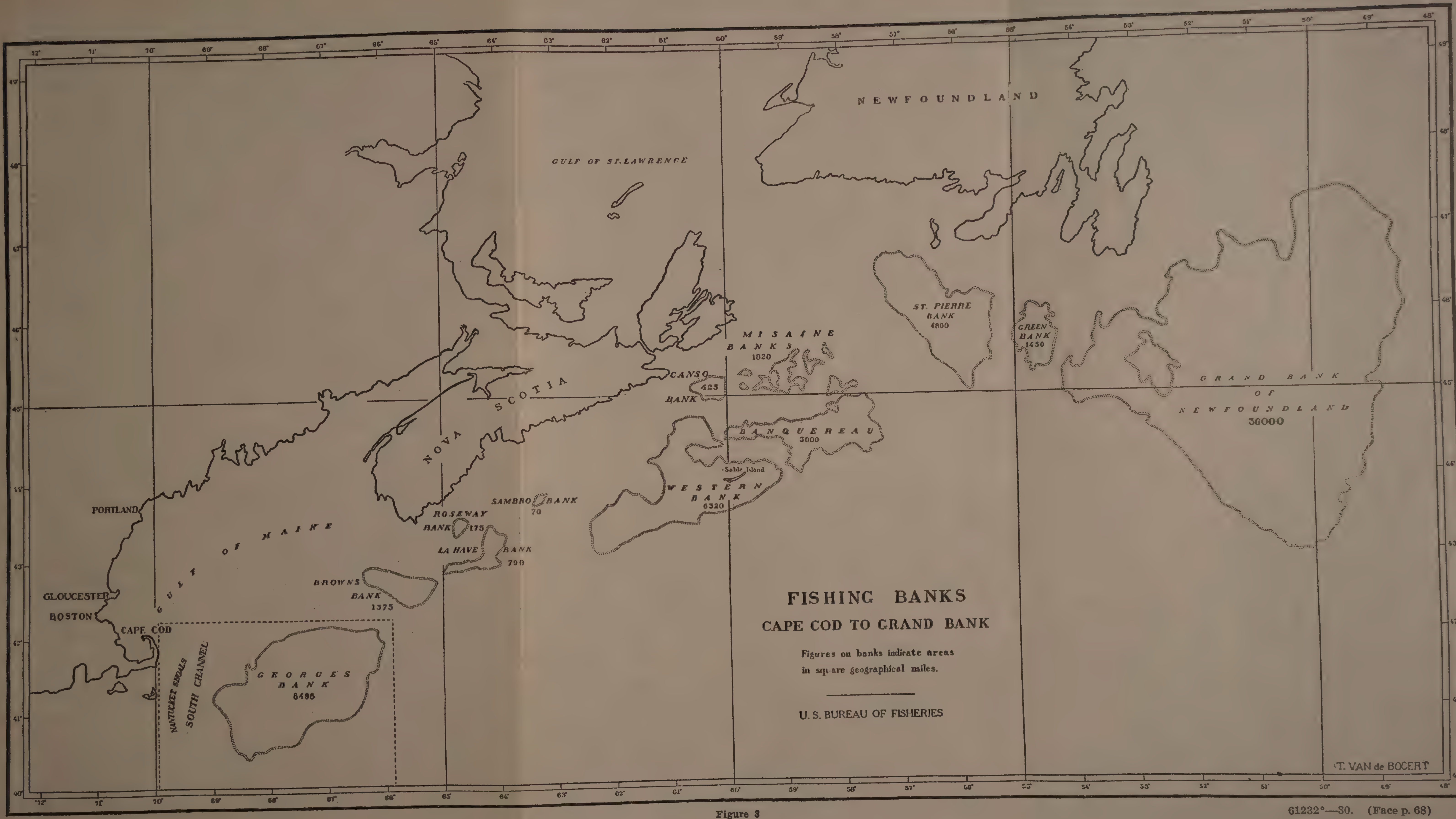
[1] Less than 60.

[2] The figures given include the areas of certain ridges to the eastward of LeHave Bank proper.

Source: U. S. Bureau of Fisheries.

TYPES OF FISHING

At present there is great differentiation in the fishing industry among the ports of New England. Boston is the leading fresh-fish port of this region, if not of the whole country. It has a large trade in the distribution of fresh fish over a considerable portion of the



FISHING BANKS
CAPE COD TO GRAND BANK
Figures on banks indicate areas
in square geographical miles.
U. S. BUREAU OF FISHERIES
T. VAN de BOCERT
NEWFOUNDLAND
GULF OF ST. LAWRENCE
NOVA SCOTIA
GULF OF MAINE
PORTLAND
GLOUCESTER
BOSTON
CAPE COD
NANTUCKET SHOALS
SOUTH CHANNEL
GEORGES BANK
6498
BROWNS BANK
1375
LA HAVE BANK
790
ROSEWAY BANK
175
SAMBRO BANK
70
CANSO BANK
425
MISAINE BANKS
1020
BANQUEREAU
3000
Sable Island
WESTERN BANK
6320
ST. PIERRE BANK
4800
GREEN BANK
1450
GRAND BANK OF NEWFOUNDLAND
36000
72° 71° 70° 69° 68° 67° 66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54° 53° 52° 51° 50° 49° 48°
49° 48° 47° 46° 45° 44° 43° 42° 41° 40°

Figure 3

eastern United States. South Boston is now the center of the deep-sea fresh-fish industry. The old T Wharf is a center for boats engaged in the inshore fishing, while East Boston cures fish and manufactures fish residue, and, in addition, large quantities of deep-sea fish are landed there.

The Cape Cod district now handles only inshore fish, and specializes in shellfish. The shallow waters around Nantucket are the source of flounders, many of which are shipped to the New York market. The waters extending from Marthas Vineyard to the western part of Long Island Sound produce various kinds of inshore fish, and the Sound ports specialize in the oyster industry.

Gloucester, the center of the salt-fish industry and the second important port for the landing of deep-sea fish in New England, has recently become important as a center for the canning of deep-sea fish. Very recently it has developed an important business in the distribution of fresh and frozen fillets.

Herring fishing is important on the Maine coast, and these fish are canned, smoked, and pickled in the ports of that State. An important phase of this industry, sardine canning, has developed in and near Eastport. Lobster fishing is important on the Maine coast and in the neighboring waters near the Maritime Provinces of Canada. The shipment of live lobsters is important at Portland.

The trend of the fishing industry during the last generation is shown by figures of total yield, which have been taken at irregular intervals during the past four decades. The following table summarizes these statistics. It shows a decline in the volume of the catch and in the number of men employed in the industry, but an increase in the investment and in the value of the annual production.

SUMMARY OF NEW ENGLAND FISHING INDUSTRY, 1880–1924

Year	Persons engaged	Investment, in thousands of dollars	Products	
			Thousands of pounds	Value, in thousands of dollars
1880	37, 043	19, 903		12, 503
1887	37, 381	20, 381	520, 214	9, 913
1888	37, 310	20, 134	572, 908	9, 860
1889	36, 536	20, 095	653, 170	10, 551
1898	35, 631	19, 637	393, 458	9, 682
1902	39, 250	20, 008	534, 075	12, 406
1905	37, 339	22, 531	480, 284	14, 184
1908	22, 157	11, 969	530, 029	15, 139
1919	30, 767	40, 597	470, 995	19, 857
1924	24, 513	28, 562	406, 822	18, 518

Source: Report of Commissioner of Fisheries, 1926, p. 301.

HISTORICAL DEVELOPMENT

Fishing made its appearance in New England waters before any permanent settlements were established. In the northern waters, now worked by Boston fishermen, British and French vessels caught fish a century before the landing of the *Mayflower*. Fish formed an important part of the diet of the first settlers, and the industry was prominent among the activities of the colonists.

Just before the Revolution the fisheries employed 10,000 men. It has been estimated that there were then 665 vessels carrying 4,400 men engaged in the cod fisheries alone. The cod was at that time the only deep-sea fish caught or eaten to any extent. The early catching of edible fish was concentrated particularly along the shores of Cape Cod, where men who fished in the summer worked in the salt factories during the winter.

The whaling industry was important in the early days—indeed, the first ship to fly the Stars and Stripes in European waters was a whaler from New Bedford. Whaling made such progress that in the middle of the last century the value of its products exceeded that of all other fisheries combined. From 1835 to 1860 the whaling fleet of New England averaged more than 600 vessels a year and brought in products worth about $8,000,000 a year. In 1857 New Bedford, which was the leader in this industry, had 329 vessels valued at $12,000,000, and over 10,000 seamen were engaged in whaling. By the outbreak of the Civil War this branch of the industry was beginning to disappear.

Gloucester gradually came to the fore in the early part of the nineteenth century, and in 1859 it had a fleet of 300 schooners employing over 3,500 hands. The mackerel industry came into being in that period, the first trip for catching and salting that fish being in 1818. Halibut were caught at Georges Bank as early as 1819, and about 1830 halibut fishing became a regularly developed phase of the fishing industry.

The herring industry of the Maine coast was firmly estalished by the middle of the last century, although herring had been used to a certain extent in earlier times. The menhaden fishing also assumed considerable importance in the middle of the last century. A number of factories along the coast were engaged in steam-cooking these fish for their oil, which was used for paint as early as 1812. Menhaden and other fish were used quite extensively also for fertilizer.

Oysters were transplanted to the shore waters of Rhode Island and Connecticut from Chesapeake Bay about 1840, and lobsters became a product of commercial importance as early as 1830. The business of canning lobsters started in Maine in 1843 and had developed to a considerable extent by 1860.

Since the Civil War there have been important changes in the fishing industry. Its position in New England is relatively less important than formerly, owing chiefly to the more rapid development of other lines of activity. As a result of the development of fisheries in other sections of the country, New England has lost its national position of preeminence in this industry. The deep-sea fisheries of this region have declined on the whole, but the inshore phase of the industry has experienced material development.

The chief change that has come about is the decline of the whaling industry. Until 1850 the only fisheries of consequence were those for whale, cod, and mackerel. By 1908 whaling had practically disappeared in New England, and the oyster led all species of fish in the value of product. The menhaden industry also became of little consequence in this region several decades ago. The cod and mackerel industries reached their maximum development in the early years of the Civil War. While these declined for a time, they by no means became unimportant and they have advanced recently.

GENERAL TREND AND PROSPECTS

The proximity of New England to the only extensive offshore fishing grounds on the Atlantic coast of the United States gives these northeastern States a unique advantage as compared with other sections. The offshore banks where cod, haddock, and other ground fish abound are immune to the harmful results of industrialization, such as stream obstruction and pollution, which have seriously affected the fisheries in certain of our river, lake, and inshore areas. The fisheries of the offshore grounds form the very backbone of New England's sea-food resources. With these grounds relatively resistant to the influences of man, there is good reason to expect the fisheries to maintain their productiveness at a relatively high level.

With the inshore fisheries, which are also highly important components of the sea-food industry, this is not the case. The Atlantic salmon, which in early days abounded in every stream of the New England coast and were taken by the thousands, are now extinct in most of the streams, and only a few hundred are taken in some of the rivers of Maine. The lobster fishery long ago failed to supply sufficient of these crustaceans for the American trade. The yield is only a fraction of what it formerly was, and many of the lobsters now on the American market come from the Canadian Maritime Provinces. Other examples of depletion might be given, but these suffice to emphasize the fact that sea-food resources are not inexhaustible and that measures to assure perpetuity of the supply are highly important to the industries which depend on these resources for their raw material. This is true of the offshore as well as the inshore fisheries, though serious depletion seems less imminent in the former case.

The responsibility for conservation in New England resides in the several State governments. The States have direct jurisdiction over fisheries and enforce whatever regulations are enacted by their respective legislatures. Their functions are largely those of enforcement and patrol, and much greater attention is accorded the fresh-water and sports fisheries than the marine and commercial fisheries. This greater attention to inland resources is largely due to the close association of fish and game laws. The whole scheme has resulted in a lack of policy with regard to commercial fisheries, which are regulated largely according to political expediency. There is no provision for the scientific study of the fisheries such as would permit the formulation of a policy providing the maximum exploitation of the resources consistent with their permanent preservation.

Under these conditions we might expect overexploitation of some kinds of fish and underexploitation of others, and this is what has actually taken place. Many kinds of fish and shellfish that were overexploited in former days are now yielding but a fraction of their potential output, while others which formerly were considered of no economic importance have now become valuable commercially, with the result that the total yield has remained very nearly constant. This becomes a matter of concern when it is realized that at the present time there are few additional kinds to turn to when those now fished decline.

The lack of a conservation policy on the part of the States is compensated to some extent by fisheries research work carried on in this region by the United States Bureau of Fisheries. This research is of assistance in developing the principles of conservation to be followed in some of the important fisheries, but it can not take the place of carefully formulated programs of conservation by the States themselves. An essential feature of such programs is the scientific observation of fishing to detect depletion in its earliest stages. Exploitation of fisheries can then proceed unhindered as long as they show no signs of depletion; when that occurs, proper restrictions might be applied promptly enough to prevent irremediable damage. Such a policy would tend to prevent the passage of unnecessary restrictive measures, and would facilitate the promulgation of needed regulations. The future of the fisheries depends largely upon the extent to which such a definite policy is followed.

The commercial and economic phases of the fisheries are here discussed in three sections under the following headings: (1) Fishing operations; (2) the wholesale fish trade; and (3) the fish canning and preserving industries.

There is quite an elaborate organization in the fishing industry. Much of the production is carried on by corporations of considerable size, which conduct both fishing and marketing operations. The New England Fish Exchange is an organization for facilitating marketing operations.

In schooner fishing the captain, as a rule, is financial manager of the trip, and he provisions the vessel and sells the catch on return to port. The receipts from the catch are divided, the vessel owner having the first lien for his share; then provisions and supplies are paid for. The captain next gets 10 per cent, and the remainder is divided between the crew and the captain. In the trawler industry the management is usually in the hands of a large corporation, and the captain and the crew are paid regular wages. The wholesalers on the pier are a separate group from the fishermen and captains, although some of the dealer-corporations own and operate vessels, particularly of the trawler class.

FISHING OPERATIONS

The enterprise of fishing is carried on in a great many ways, the operating units varying in size and importance from the one-man boat fishing alongshore to the 200-ton vessel sailing out to the offshore banks; and from simple apparatus, like hook and line or dip net, to the relatively complicated otter trawls, pound nets, or purse seines. An arbitrary division between the small boat or shore fisheries and the vessel fisheries appears in the published statistics on the subject. Fishing carried on by boats of 5 tons net and over, as measured by the customs service, is included in the vessel fishery, and all fishing carried on with smaller boats or without boats is regarded as shore fisheries.

Vessel fishing is concerned primarily with the catch of the ground fish, which live and feed close to the bottom of the sea. The chief ground fish are cod, haddock, halibut, hake, cush, pollock, and flounders. The mackerel and swordfish are not ground fish. They live and feed farther from the bottom, but they are caught in the vessel fisheries.

GROUND FISH

The fishing for cod, haddock, halibut, hake, cusk, and pollock is probably the oldest and most typical of the New England fisheries. In recent years flounders have become important components of the ground-fish catch. These fish are found principally on the offshore banks, although large quantities are also taken on the grounds along the shore.

SPECIES OF FISH LANDED BY FISHING VESSELS AT BOSTON, GLOUCESTER, AND PORTLAND, 1893 TO 1928

[In thousands of pounds]

Year	Cod		Haddock		Hake		Pollock	
	Fresh	Salted	Fresh	Salted	Fresh	Salted	Fresh	Salted
1893	20,254	34,373	33,865	44	19,754	238	3,453	161
1894	27,762	35,829	45,608	4	23,305	39	2,175	6
1895	24,071	43,228	41,578	28	15,176	165	2,356	122
1896	25,448	34,040	30,167	---------	10,526	18	1,908	255
1897	27,238	24,757	30,978	---------	14,679	18	1,891	---------
1898	31,674	26,485	32,482	37	17,502	19	4,464	29
1899	48,294	36,906	33,291	15	16,657	53	7,343	144
1900	34,051	29,969	33,043	6	11,445	78	5,278	41
1901	35,972	29,719	28,930	46	11,121	148	7,345	98
1902	36,373	30,248	38,395	2	14,264	134	12,580	16
1903	30,557	27,195	40,339	4	14,769	78	11,290	154
1904	30,636	21,443	47,509	532	21,887	237	10,521	637
1905	36,137	17,852	65,897	423	22,781	457	20,409	1,646
1906	36,196	18,323	61,195	400	13,027	260	8,522	988
1907	45,953	15,368	41,815	463	19,580	214	20,428	776
1908	41,615	21,832	47,418	641	20,434	122	12,429	1,090
1909	38,590	32,744	42,401	425	13,163	113	12,502	1,381
1910	35,549	25,790	49,227	340	19,759	189	18,808	816
1911	33,977	19,729	55,711	464	18,097	355	14,747	879
1912	35,519	18,186	63,225	323	15,289	270	14,359	307
1913	29,177	15,688	53,436	237	13,740	345	15,031	236
1914	36,080	11,450	57,599	155	12,531	222	12,243	211
1915	34,088	10,968	57,813	131	14,589	301	12,961	235
1916	35,993	7,629	60,371	184	13,029	143	15,502	101
1917	49,873	6,574	53,395	160	7,839	75	14,467	40
1918	68,338	3,487	66,602	68	5,246	35	26,507	53
1919	60,651	4,723	82,561	155	4,300	40	18,696	56
1920	58,407	3,858	75,235	45	4,666	55	8,539	22
1921	48,106	5,409	67,397	15	4,494	42	6,893	52
1922	50,174	5,006	70,065	131	5,341	33	5,048	49
1923	58,232	4,443	73,718	44	6,315	22	4,766	39
1924	58,656	2,793	79,897	5	7,263	22	5,067	18
1925	64,097	3,153	91,861	25	5,789	17	5,243	47
1926	73,637	4,582	93,983	77	5,482	23	6,705	34
1927	61,367	1,987	128,543	50	5,845	17	7,652	11
1928	58,155	1,147	155,322	8	8,411	11	8,032	9

NOTE.—Prior to 1916, Portland landings are lacking.

SPECIES OF FISH LANDED BY FISHING VESSELS AT BOSTON, GLOUCESTER, AND PORTLAND, 1893 TO 1928—Continued

Year	Cusk		Halibut		Mackerel		Flounders
	Fresh	Salted	Fresh	Salted	Fresh	Salted	Fresh
1893	9,110	174	7,964	1,829	552	8,744	----------
1894	10,454	191	9,378	1,527	936	7,077	----------
1895	5,566	255	8,660	1,062	553	4,033	----------
1896	3,322	305	9,689	1,207	1,136	10,484	----------
1897	3,049	144	8,329	1,572	1,146	1,784	----------
1898	4,918	107	8,381	1,997	874	2,222	----------
1899	3,411	228	8,236	789	1,230	3,862	----------
1900	2,018	131	7,275	1,569	8,889	15,966	----------
1901	2,029	52	5,065	463	2,783	12.013	----------
1902	1,785	21	6,326	753	2,772	8,139	----------
1903	2,881	78	3,622	832	2,040	8,032	----------
1904	5,414	236	2,437	853	2,182	5,184	----------
1905	8,797	231	2,952	515	3,499	5,645	----------
1906	5,101	230	4,019	636	1,740	2,100	--------
1907	7.027	72	3,293	904	4,091	6,386	----------
1908	5,067	141	3,179	947	5,508	3,467	----------
1909	3,148	185	3,589	860	4,121	3,458	----------
1910	4,504	191	2,988	1,036	583	610	----------
1911	6,433	248	3,091	411	3,099	1,439	----------
1912	6,317	163	3,060	481	2,660	1,548	----------
1913	5,816	144	4,756	532	4,293	1,383	400
1914	5,747	112	3,063	317	3,980	2,708	863
1915	6,236	95	3,584	286	7,345	3,574	652
1916	6,017	52	3,364	95	10,832	5,075	1,298
1917	3,525	24	1,724	42	12,032	5,410	1,280
1918	2,644	14	1,770	11	7,583	2,576	2,270
1919	2,025	38	2,100	15	4,315	1,398	2,452
1920	1,849	6	3,768	22	6,284	1,008	3,638
1921	2,060	38	5,618	48	2,735	650	2,605
1922	2,194	54	5,608	16	4,266	460	3,281
1923	2,911	87	4,873	2	10,684	881	3,437
1924	3,344	62	4,422	1	8,474	1,283	4,335
1925	3,606	107	3,553	8	24,115	2,095	6,638
1926	2,694	34	3,426	5	35,123	1,109	6,779
1927	2,693	34	4,773	6	31,354	176	8,359
1928	2,350	7	3,382	4	24,165	88	10,414

Year	Herring		Swordfish		Other		Total	
	Fresh	Salted	Fresh	Salted	Fresh	Salted	Fresh	Salted
1893	----------	----------	----------	----------	1,045	837	95,996	46,400
1894	799	1,224	417	----------	285	99	121,119	45,996
1895	----------	----------	----------	----------	1,717	1,869	99,677	50,762
1896	----------	----------	----------	----------	1,549	620	83,745	46,929
1897	----------	----------	----------	----------	8,354	2,926	95,664	31,201
1898	6,138	4,244	----------	----------	1,448	392	107,881	35,523
1899	6,082	7,412	----------	----------	2,730	91	127,274	49,500
1900	----------	----------	----------	----------	5,184	7,276	107,183	55,086
1901	1,719	10,030	----------	----------	1,475	2,157	96,439	54,726
1902	2,637	10,023	----------	----------	2,091	1,395	117,223	50,731
1903	3,097	7,887	----------	----------	2,847	1,790	111,442	46,050
1904	2,917	16,270	2,151	3	117	----------	125,771	45,395
1905	6,882	8,569	2,009	----------	172	14	169,535	35,352
1906	5,273	10,935	928	----------	517	12	136,518	33,884
1907	5,402	15,614	2,044	----------	2,142	----------	151,775	39,797
1908	6,708	8,629	1,358	----------	880	----------	144,596	36,869
1909	4,421	9,278	1,637	----------	1,059	27	124,631	48,471
1910	4,994	14,720	1,039	----------	592	----------	138,043	43,692
1911	6,399	16,752	1,503	----------	1,807	11	144,864	40,288
1912	5,885	10,005	1,810	----------	3,297	----------	151,421	31,283
1913	2,070	9,677	2,376	5	2,875	----------	133,970	28,247
1914	4,910	5,839	1,500	----------	3,059	----------	141,575	21,014
1915	4,346	8,931	2,239	----------	3,222	(1)	147,075	24,521
1916	11,410	7,223	1,773	----------	5,732	1	165,321	20,503
1917	6,817	6,322	1,973	----------	3,858	----------	156,783	18,647
1918	8,764	6,233	1,034	----------	2,265	----------	193,024	12,477
1919	6,858	3,502	883	----------	1,702	11	186,543	9,938
1920	3,901	3,097	2,532	----------	1,348	----------	170,167	8,113
1921	2,262	351	1,598	----------	491	1	144,259	6,606
1922	752	1,892	3,282	----------	2,178	44	152,189	7,685
1923	264	1,219	2,455	----------	561	9	168,216	6,746
1924	1,467	2,943	2,023	----------	873	----------	175,821	7,127
1925	1,542	2,400	1,527	----------	1,046	----------	209,017	7,852
1926	1,266	315	2,442	----------	710	----------	232,247	6,179
1927	2,735	4,410	2,246	----------	1,591	----------	257,158	6,691
1928	706	1,411	2,544	----------	1,816	----------	275,297	2,685

[1] Less than 500 pounds.

NOTE.—Prior to 1916, Portland landings are lacking.

METHODS EMPLOYED

Hand-line fishing was the principal method employed in the early days of the ground-fish activity. In this method fishing was done from the deck of the vessel, each man operating a single line carrying one or two baited hooks.

Hand lines have been largely displaced by trawl lines. The latter consist of ground lines appropriately equipped with gangings carrying baited hooks, together with buoys, buoy lines, and anchors. The usual number of hooks to a set varies from 24,000 to 32,000. They are fished from dories. Each vessel carries 12 to 16 dories, which are launched from the vessel after arriving on the fishing banks. Lines are set and hauled from the dory. Sometimes two sets are made during the daytime, and sometimes overnight sets are made. In any case the fish are returned to the vessel, and when the full cargo is made the vessel proceeds to the landing port. The trawl-line method was for a long time the principal one used in vessel fishery, and it still accounts for a large share of ground fish landed. It is a hazardous task to manage the dories, and in bad weather many a dory with its fishermen has failed to return to its schooner.

Since 1900 otter-trawl vessels have entered the ground fishing operations. The otter trawl consists of a bag-shaped net which is dragged along the bottom, catching any fish which lie in its path. The mouth of the net is kept open by the kite action of the otter boards, from which the net derives its name.[1]

The real start of the trawling business in New England was made in 1906, when the little steam trawler *Spray* from the Fore River Shipbuilding Co.'s plant at Quincy was put into service. This pioneer boat was followed by others owned by the Bay State Fishing Co. During the war there was a spurt in the use of trawlers and about 60 craft were in commission. With the slump in the industry at the end of the war, many of these vessels were laid up. Since 1920, however, the fleet has been steadily built up again, the recent trend toward the use of trawlers being marked. In 1928 there were 49 otter-trawl steam and motor vessels in operation, landing over 91,000,000 pounds of fish (fresh weight) out of the total of 280,000,000 pounds landed by all vessels at Boston, Gloucester, and Portland.

The above, as stated previously, refers to the large steam and motor vessels which operate a net about 120 feet across the mouth. In most recent years an otter trawl about half this size, and termed a "flounder drag" or "drag," has been used in catching flounders. Except for size it is essentially the same net as used by the steam trawlers.

Most of the large boats are corporation owned, but many small ones are owned by individual fishermen. The small trawlers are most important in the Nantucket region, where they are used for catching flounders. During fair weather the old-fashioned schooners and dories can operate readily, but in the rougher weather of winter the trawlers take a relatively larger part in the fishing industry. Otter-trawl vessels landed 25.2 per cent of the quantity and 20.7 per cent of the value of the total catch landed by fishing vessels at New England ports in the year 1925. In 1927 there were in the New England vessel fleet 25 otter trawlers, which landed 77,600,000 pounds, out of a total vessel catch of 264,000,000 pounds.

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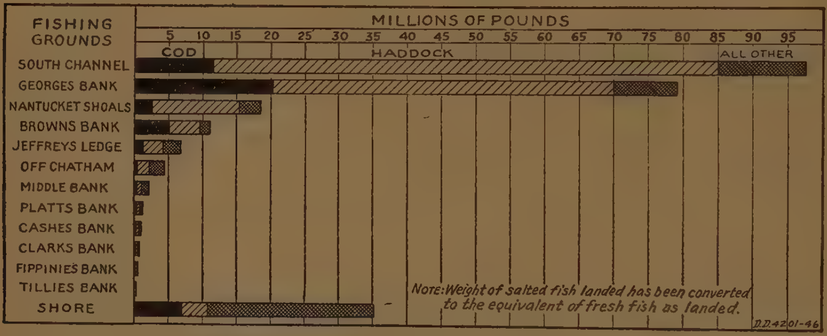
[1] For further details of the otter-trawl and line-trawl fisheries consult "Otter Trawl Fishery," by A. B. Alexander, H. F. Moore, and W. C. Kendall. Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1914.

The fishing with otter trawls is necessarily confined to grounds where the bottom is relatively smooth and free from obstructions. This has resulted in the concentration of such fishing on the South Channel grounds and Georges Bank, which are particularly favorable. In 1928, of the 91,000,000 pounds of fish (fresh weight) caught by steam and motor trawlers, 83,000,000 were taken from these grounds.

PRINCIPAL SPECIES

Both the methods of fishing and the changes in market conditions have had notable effects in the nature of the catch over a series of years. Virtually the entire catch originally went into the salt-fish trade, the most of the catch being salted aboard the vessels and landed at Gloucester. Cod was the species most sought, and, with the exception of halibut, the others were considered purely incidental.



NOTE: Weight of salted fish landed has been converted to the equivalent of fresh fish as landed.

Figure 4.—Relative productiveness of various fishing areas and principal species of catch

With increased facilities for transportation and refrigeration, the fresh-fish trade grew at the expense of salt-fish trade. This placed a premium on fish from shorter trips made to near-by grounds. In the days of salt fish much of the catch came from grounds as far as Grand Bank, a thousand miles distant from port. Now, most of the catch comes from near-by grounds.

With the development of the fresh-fish trade, species other than cod have been utilized extensively. The landings of haddock illustrate the point most strikingly. The advent of otter-trawl fishing in South Channel and on Georges Bank, where haddock appear to be most abundant, gave rise to the increased importance of this species. Recently the catch of haddock has been further stimulated by the trade in packaged fish, which utilizes this species to a much greater extent than any other.

LANDINGS OF FISH BY FISHING VESSELS AT PRINCIPAL NEW ENGLAND PORTS, 1893–1928

[In thousands of pounds]

Year	Boston		Gloucester		Portland		Total	
	Fresh	Salted	Fresh	Salted	Fresh	Salted	Fresh	Salted
1893	66, 518	1, 077	29, 479	45, 323	(1)	(1)	95, 996	46, 400
1894	86, 129	1, 336	34, 990	44, 662	(1)	(1)	121, 119	45, 998
1895	73, 612	196	26, 065	50, 567	(1)	(1)	99, 677	50, 763
1896	61, 820	1, 256	21, 925	45, 673	(1)	(1)	83, 745	46, 929
1897	62, 704	200	32, 960	31, 002	(1)	(1)	95, 664	31, 201
1898	53, 494	1, 186	54, 387	34, 337	(1)	(1)	107, 880	35, 523
1899	63, 450	1, 274	63, 824	48, 226	(1)	(1)	127, 274	49, 500
1900	63, 648	3, 173	43, 536	51, 862	(1)	(1)	107, 183	55, 036
1901	56, 855	2, 137	39, 584	52, 589	(1)	(1)	96, 439	54, 726
1902	77, 609	1, 365	39, 615	49, 366	(1)	(1)	117, 223	50, 731
1903	78, 383	1, 883	33, 059	44, 167	(1)	(1)	111, 442	46, 050
1904	81, 183	911	44, 588	44, 484	(1)	(1)	125, 771	45, 395
1905	101, 085	222	68, 451	35, 131	(1)	(1)	169, 535	35, 352
1906	89, 610	83	46, 907	33, 801	(1)	(1)	136, 517	33, 884
1907	87, 717	394	64, 057	39, 403	(1)	(1)	151, 775	39, 797
1908	94, 713	947	49, 883	35, 923	(1)	(1)	144, 596	36, 869
1909	92. 085	491	32, 546	47, 980	(1)	(1)	124, 631	48, 471
1910	102, 059	31	35, 983	43, 661	(1)	(1)	138, 043	43, 692
1911	93, 629	131	51, 236	40, 158	(1)	(1)	144, 865	40, 289
1912	100, 157	143	51, 264	31, 140	(1)	(1)	151, 421	31, 283
1913	92, 203	149	41, 768	28, 098	(1)	(1)	133, 970	28, 247
1914	92, 231	113	49, 344	20, 901	(1)	(1)	141, 575	21, 014
1915	97, 397	502	49, 678	24, 018	(1)	(1)	147, 075	24, 520
1916	98, 255	76	46, 515	20, 165	20, 551	261	165, 321	20, 503
1917	98, 155	496	40, 062	18, 073	18, 566	79	156, 783	18, 647
1918	109, 227	249	62, 002	12, 173	21, 795	55	193, 024	12, 477
1919	103, 209	183	61, 622	9, 749	21, 713	6	186, 544	9, 938
1920	118, 302	257	39, 113	7, 627	12, 752	229	170, 167	8, 114
1921	104, 277	91	26, 747	6, 270	13, 235	246	144, 258	6, 607
1922	106, 032	158	30, 396	7, 356	15, 762	172	152, 190	7, 686
1923	123, 982	253	29, 012	6, 018	15, 221	475	168, 216	6, 746
1924	130, 631	335	29, 263	6, 583	15, 927	209	175, 822	7, 127
1925	148, 723	315	42, 161	7, 311	18, 133	226	209, 017	7, 852
1926	167, 061	257	49, 222	5, 679	15, 964	244	232, 247	6, 180
1927	194, 877	64	46, 056	6, 497	16, 226	131	257, 158	6, 691
1928	218, 353	34	39, 407	2, 497	17, 536	154	275, 297	2, 685

[1] Statistics for Portland not available prior to 1916.

Source: U. S. Bureau of Fisheries.

TREND OF GROUND FISH PRODUCTION

The trend in the production of various species of ground fish may be seen from the following table and that on page 73. During the past 40 years the production of cod has had a slight downward trend, but haddock increased from about 43,000,000 pounds to nearly 94,000,000 pounds by 1924. By 1928 the landings of the three ports amounted to 155,000,000 pounds. Flounders increased from the relatively unimportant catch of 3,000,000 pounds to a place of importance, with nearly 31,000,000 pounds. Landings of hake and pollock increased during the first half of the period, but have since decreased. The causes are problematic, but may possibly be found in the changing composition of the catch in consequence of the employment of otter trawls. They may, however, be the result of natural fluctuations in abundance, or the effect of depletion in recent years.

CATCH OF PRINCIPAL SPECIES OF GROUND FISH IN NEW ENGLAND

[In thousands of pounds]

Year	Cod	Haddock	Hake	Pollock	Halibut	Flounders	Total
1889	97, 146	43, 474	14, 816	8, 442	10, 741	2, 951	177, 570
1898	89, 208	45, 676	37, 184	9, 445	10, 828	4, 109	196, 450
1902	88, 255	47, 077	33, 183	17, 744	12, 366	4, 809	203, 434
1905	75, 065	76, 617	35, 471	28, 949	3, 018	5, 761	224, 881
1908	95, 284	59, 544	34, 121	29, 244	4, 354	9, 753	232, 300
1919	84, 918	89, 406	20, 222	25, 010	1, 960	15, 541	237, 057
1924	89, 218	93, 519	18, 499	8, 295	4, 501	30, 855	244, 887

Source: U. S. Bureau of Fisheries.

The case of halibut is undoubtedly one of depletion. The landings in 1889 were nearly 11,000,000 pounds, and in earlier years they were undoubtedly larger. In 1924, however, they had dropped to 4,500,000 pounds. Unless measures are taken to conserve this species we can not expect the catch to increase materially. On the other hand, if the demand causes greater intensity of fishing for this species, in all probability the supply will become further depleted, and eventually the catch will disappear.

Of the 6 principal kinds of ground fish 2 have decreased and 2 have increased. The increases have more than offset the decreases, resulting in a total increase.

Whether this general increase of ground fish can continue is a question of great interest and importance. It is seen that most of the increase has come in two species—haddock and flounders. Both of these are taken in fairly restricted regions. Reference to Figure 4, showing the relative catch of haddock on various fishing grounds, indicates strikingly the concentration of this species on South Channel and Georges Bank fishing grounds. Unless other grounds are developed, and this seems unlikely, we can not look forward to continuing expansion at the same rate as indicated up to this time. The matter of expansion in the flounder fishery is quite similar.

On the other hand, there is reason to believe that the fishery for cod has decreased as a result of economic rather than natural causes. The United States takes only 12 per cent of the total catch of cod in this region. The remainder is taken by the fishermen of Newfoundland, Canada, France, and Portugal. The total catch by all nations has averaged above a billion pounds annually and has shown no tendency to decrease during the past 40 years.[2] It is believed that because of the natural advantages enjoyed by the fishermen of New England the American catch could be increased considerably, provided a sufficient demand existed. This, in addition to potential supplies of other ground fish, makes it seem possible that the catch of ground fish may continue to increase substantially before reaching the limits of this resource.

MACKEREL

Next in importance to the ground-fish activities, and equally important in the history of New England, is the mackerel fishery.

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[2] See "Statistics of the Catch of Cod off the Eastern Coast of North America to 1926," by O. E. Sette, Bureau of Fisheries Document 1033; Appendix VIII, Report of U. S. Commissioner of Fisheries, 1927; Bureau of Fisheries Document No. 1034.

Originally this was prosecuted by means of hand lines from the decks of mackerel vessels. This method has long since been displaced by purse seining. The purse seine is a curtain-shaped net about 250 fathoms long and 20 fathoms deep, which is laid around the school of fish. The bottom is then closed by drawing the purse line.

Purse seining is done by the larger vessels of the fishing fleet. Most of these have their home port at Gloucester, from where they sail in search of mackerel, as far south as Cape Hatteras and as far north as the Gulf of St. Lawrence. The catches are landed at Cape May on the New Jersey coast, at New York City, and at New England ports, depending on the locality in which the mackerel are taken.

Of somewhat lesser importance is the drift gill-net fishery for mackerel, although it is by no means negligible. This is pursued, as a rule, by somewhat smaller vessels than the purse seiners. The netters set their curtain-shaped nets in the evening some 3 miles along the surface. They haul them in in the morning and remove the mackerel which have been entangled in the nets. Practically the same localities are fished and the same ports of landing are used as in the case of the purse-seine fishery. Additional quantities of mackerel are caught in the shore gear, such as pound nets, but by far the larger part of the catch is taken by the purse seines and the gill nets.

The mackerel fishery more than any other fishery of New England is characterized by great fluctuations from year to year. There have been periods of abundance followed by years when mackerel were so scarce as to be almost negligible. When this fish is abundant it forms a very important contribution to the New England fish production. Reference to the table on page 74 will give an idea of the wide fluctuations to which this fishery is subject.

In the years prior to 1885 the catch of mackerel was many times larger than it has been in any year since. Recent studies by the Bureau of Fisheries have indicated that the principal cause of fluctuations in the mackerel fishery is the uncertainty of reproduction in various years. In some years the spawning season is good and a great many young mackerel survive to augment the stocks, while successive years may result in virtually no offspring. The relatively large catches of 1925, 1926, 1927, and 1928, were largely the result of a good crop of mackerel from one spawning season, presumably that of 1923. There seems no reason to believe that, given a succession of good spawning years, the fishery might not attain the importance enjoyed by it in 1885 and prior years. The fact remains, however, that the mackerel fishery is likely to continue to fluctuate widely in its annual catch, and therefore can not be a mainstay to the same extent as the ground-fish fisheries.

SWORDFISH

The only other vessel fishery of importance to be considered is that for swordfish. This can hardly be regarded as a distinct fishery. The swordfish is harpooned from a pulpit extending over the bow of fishing vessels. In season some vessels are outfitted exclusively for swordfish, but a large portion of the catch is made by vessels engaged primarily in other fisheries. Swordfish make a more important contribution to the fish production than appears from the quantity caught, because of the high price this species brings in the market. In 1927 fishermen received an average of 23 cents a pound for swordfish, as compared with 3 cents for haddock. As in the mackerel fishery, the results of the swordfish catch vary widely from year to year, but, on the whole, are somewhat more stable than in the mackerel catch. Whether the swordfish fishery may be developed beyond its present importance can only be conjectured. Judging from the zeal with which this fishery is prosecuted, it is unlikely that the catch can develop beyond its present status.

HERRING

The herring fishery is of greatest importance as a source of material for sardine canning along the coast of Maine. Only the young of the herring are used for this purpose. They are caught in brush weirs which are constructed on the shoals in the bays and inlets along the broken coast of Maine and the neighboring shores of the Maritime Provinces of Canada. They are concentrated particularly in the Passamaquoddy Bay region, though weirs are fished as far west as Portland. The weir consists of a brush fence which leads the young herring into a brush inclosure, from which they find difficulty in getting out. They are removed from the inclosure with seines and are delivered to the canneries.

A large portion of the raw material for the Maine canneries—perhaps 75 per cent—is collected by their vessels from weirs on the Canadian side of the bay. No reliable statistics are available on total quantity of fish caught in the weirs, both American and Canadian, but the production of canned sardines in Maine gives an idea of the quantities used by the canneries. (See p. 89.) In addition to the young or sardine herring, some quantities of large, mature herring are caught in gill nets, pound nets, and seines. These are sold either fresh or salted, or for bait. By treaty provisions American fishermen may visit certain portions of the south and west coasts of Newfoundland, where herring fishing is carried on. In 1927 the vessels engaged in the herring fishery there landed cargoes of herring at Gloucester aggregating 2,106,846 pounds (fresh weight).

It is estimated that during the season approximately 1,500 craft of various sizes and types are engaged in moving the herring to the canneries. The season extends from April to November, with a lull from the middle of June until August. Most of these craft are gasoline motor boats, many of which are engaged in clam gathering, lobster and scallop fishing, and trawing during the idle time in the sardine industry, although a large number of the vessels are put up for the winter. The boats are owned both by canners and by fishermen.

There is a considerable investment in the canneries. Some of the larger factories are valued at about $200,000, and many of the older ones are valued at $60,000 to $75,000.

The pack in 1925 in Maine and Massachusetts was 1,778,860 cases. This amount would require about 100,000,000 pounds of fresh herring. In 1927 only 1,262,124 cases were packed, valued at $5,249,030. Fully one-third of the pack is put up in keyless or pressed-tin cans, most of the rest being packed in keyed or roll-top cans. Cottonseed oil is used for packing the greater part of the output, but the fancy packs use olive oil, and a few canners use tomato sauce. About one-fifth of the pack is put up in mustard.

LOBSTERS

Lobster fishing is carried on along all coasts of New England, but Maine produces over half of the total catch. This amounts to about 9,700,000 pounds annually, with a value to the fishermen of about $3,000,000. Lobsters are caught in baited traps called lobster pots. These pots are very much like lath crates with a funnel-shaped entrance, through which the lobster readily enters but finds difficulty in escaping. This type of operation is a small-boat fishery, the pots being anchored to the bottom on the ledges and reefs along the coast, and visited every few days for removal of the lobsters and for re-baiting. The following table shows the number of pots used and the catch in 1924, and in the previous years for which statistics are available.

LOBSTER FISHERY OF NEW ENGLAND

Year	Lobster pots fished	Total catch		Average catch per pot	
		Quantity	Value	Quantity	Value
		Pounds		*Pounds*	
1924	256,662	9,716,196	$3,072,411	38	$11.97
1919	239,558	10,666,707	2,550,980	45	10.65
1908	[1] 176,365	14,735,000	1,857,000	------	------
1905	190,364	11,524,499	1,319,107	61	6.93
1902	212,690	14,756,495	1,336,572	69	6.28
1898	205,049	14,661,808	1,276,967	72	6.23
1889	175,458	30,449,603	833,736	------	------

[1] Includes eel pots.

Source: U. S. Bureau of Fisheries.

A decline from 30,000,000 to less than 10,000,000 pounds since 1889 is the most striking thing to be observed from the table. This decline has occurred in spite of the greater number of pots in use. This fact is brought out more forcibly by the figures on the average yield per pot, which shows a decline from 72 to 38 pounds since 1898. The price has increased more than the decline in quantities. The value of the catch per pot in 1924 was nearly twice as great as in 1898. All these observations—the decreased total catch in spite of increased gear, the decreased catch per pot, and the strong increase in prices—point indisputably to depletion.

This decline has long been recognized, and attempts to regulate the fishery have been made by the States, but these efforts have been partially nullified by the lack of uniform size limits in the various States. The general inadequacy of the regulations has permitted depletion to continue. Thus, it seems that a continued decline in the volume of the lobster catch is probable, and when this reaches such a low point that it can not be offset by increased prices, the income of fishermen may be seriously impaired.

Canned lobster first assumed commercial importance in 1842, with the establishment of a lobster cannery in Maine. There was no regulation of the industry until 1879, and, meanwhile, through the destruction of young lobsters and females with eggs, the supply decreased very greatly. Since 1884 all the New England States have passed laws against the taking of small lobsters and the destruction of the females carrying eggs. Massachusetts even seizes supplies of imported lobsters that are below the legal size limit and distributes them on favorable growing locations along the coast. For a time the canning industry was stopped for a part or even all the year, but the supply continued to decrease. Recently, with measures to protect the oncoming natural supply and with the introduction of artificial propagation, the industry has been recovering.

There are estimated to be approximately 4,000 men engaged in lobster fishing in Maine and 500 in Massachusetts. Many lobsters are brought in also from Nova Scotia. In 1924 Portland received 1,250,000 pounds of live lobsters from the waters of Maine and Nova Scotia. In 1925 the Massachusetts lobster fisheries took 1,573,000 pounds. Maine formerly did a fairly extensive business in canning lobsters, which came from Canadian waters. In late years no lobsters have been canned in New England.

OYSTERS

Oysters were introduced into New England from Chesapeake Bay about 1840. This industry is restricted mostly to waters south of Cape Cod. Northward the temperatures are for the most part too low for oyster culture. This practically limits the activity to the shallow waters of Connecticut, Rhode Island, and the southern shore of Massachusetts. The oyster, more than any other marine animal, lends itself to farming operations. Shells, or cultch, are spread on the bottom at the spawning season, and the minute young oysters settle on the cultch, where they find suitable surface for attachment. These are later fished up as spat, or seed oysters, and distributed on the growing bottoms. After a suitable growing period the oysters are again fished up and marketed.

The farming or cultural operations are virtually a necessity in New England waters because of the limited extent of suitable spawning grounds. By making the maximum use of these for the production of spat, a much larger area of growing grounds may be seeded and thus converted from barrenness to a productive condition. The oyster bottoms are leased by the States to private parties for the purpose of oyster farming and are then known as private grounds.

The next table shows the productivity of New England oyster fisheries. Virtually all the market oysters are produced on private grounds, only 3,000 of the 1,039,000 bushels of oysters having come from public grounds in 1924. The production of seed oysters exceeds that of market oysters. Large quantities of these are sold and are planted in waters outside the New England States. With the adoption of improvements in the technique of oyster farming developed by the Bureau of Fisheries, it is probable that oyster farming in New England can be greatly expanded. Within recent years pollution of the waters along the Sound from factories and from domestic sewage has had a serious effect upon oyster production.

Oyster Production of New England in 1924

Product	Massachusetts		Rhode Island		Connecticut		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Market oysters:	*Bushels*		*Bushels*		*Bushels*		*Bushels*	
Public			500	$750	2, 630	$3, 865	3, 130	$4, 615
Private	75, 893	$267, 811	368, 598	457, 614	591, 488	683, 034	1, 035, 979	1, 408, 459
Total	75, 893	267, 811	369, 098	458, 364	594, 118	686, 899	1, 039, 109	1, 413, 074
Seed oysters:								
Public	6, 800	5, 325			54, 850	55, 933	61, 650	61, 258
Private	17, 000	12, 450			496, 788	583, 224	513, 788	595, 674
Total	23, 800	17, 775			551, 638	639, 157	575, 438	656, 932
Grand total	99, 693	285, 586	369, 098	458, 364	1, 145, 756	1, 326, 056	1, 614, 547	2, 070, 006

Source: U. S. Bureau of Fisheries.

CLAMS

Clam fishing is carried on in all the coastal New England States, but is most important in Maine and Massachusetts. Many clams are canned in Maine, but elsewhere they go largely into the fresh market. Two kinds are principally taken—the quahog, or hard clam, and the soft clam. Of the total catch, approximately three-fourths are soft clams.

Examination of records covering the past 45 years shows that the yield of soft clams has declined from 11,500,000 to 6,300,000 pounds, and that of hard clams has increased from 500,000 to 1,700,000 pounds. It appears that the soft clams have been somewhat depleted, and the hard clams have been utilized as a substitute to a limited extent. A serious difficulty confronting the clam industry is the pollution of beds near cities and the consequent closure of these areas to clamming. Such measures in the interest of public health have operated to decrease the production of clams. If means were found to protect such beds from pollution, thus opening them to clamming, the yield might be considerably increased.

Yield of Clams in New England in 1924

State	Soft clams		Hard clams (quahogs)		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
	Bushels		*Bushels*		*Bushels*	
Maine	357, 634	$228, 251	120	$80	357, 754	$228, 331
New Hampshire	3, 600	3, 600			3, 600	3, 600
Massachusetts	252, 035	297, 763	152, 721	359, 889	404, 756	657, 652
Rhode Island	8, 240	15, 480	54, 050	134, 500	62, 290	149, 980
Connecticut	4, 435	12, 155	2, 954	10, 773	7, 389	22, 928
Total	625, 944	557, 249	209, 845	505, 242	835, 789	1, 062, 491

Source: U. S. Bureau of Fisheries.

MISCELLANEOUS SHORE FISHERIES

In addition to herring, lobster, and oyster fishing there are other extensive fisheries along the entire New England coast operating pound nets, gill nets, seines, lines, and other apparatus. The catch includes many of the fish mentioned in connection with the vessel fisheries, and, in addition, such fish as alewives, shad, smelt, whiting, squeteague or sea trout, butterfish, scup, bluefish, and many others are taken. The catch of such species in 1924 aggregated about 15,000,000 pounds.

SUMMARY OF NEW ENGLAND FISHING ACTIVITIES

In the following table the statistics of New England fisheries as of 1924 have been summarized. It may be seen that 777 vessels of 5 tons net and over were engaged in fishing or in transporting fish from the catching grounds to the landing ports; that over 10,000 boats were engaged in fishing; and that the catch of about 407,000,000 pounds was valued to the fishermen at $19,000,000. Over 44 different kinds of fish are included in the total, but the 23 kinds enumerated separately in the table made up 97 per cent of the catch and are the only ones of any great importance.

EXTENT OF FISHING OPERATIONS, AND CATCH OF PRINCIPAL SPECIES IN NEW ENGLAND STATES IN 1924

Item	Maine	New Hampshire	Massachusetts	Rhode Island	Connecticut	Total
Fishing and transporting vessels	230	3	333	81	130	777
Boats	4, 673	72	3, 388	993	896	10, 022
Fishermen [1]	6, 252	134	7, 123	1, 176	1, 298	15, 983
Value of products	$4, 136, 989	$56, 029	$10, 799, 598	$1, 818, 858	$2, 006, 658	$18, 818, 132
	Thousands of pounds					
Catch of principal species:						
Alewives	1, 095	----------	2, 444	376	110	4, 025
Butterfish	12	----------	378	685	6	1, 081
Cod	21, 410	98	65, 815	1, 357	539	89, 219
Cusk	1, 568	1	2, 658	----------	----------	4, 227
Eels	157	6	414	168	112	857
Flounders	343	----------	22, 996	3, 099	4, 416	30, 854
Haddock	15, 508	144	77, 684	134	49	93, 519
Hake	11, 721	25	6, 712	38	3	18, 499
Halibut	141	----------	4, 360	----------	----------	4, 501
Herring	47, 930	----------	11, 799	507	----------	60, 236
Mackerel	2, 293	----------	21, 676	2, 381	304	26, 654
Menhaden	1	----------	522	1, 743	5, 270	7, 536
Pollock	2, 777	4	5, 349	116	48	8, 294
Scup	----------	----------	158	1, 192	2	1, 352
Shad	244	----------	172	11	89	516
Smelt	628	4	38	8	11	689
Swordfish	863	----------	1, 733	200	80	2, 882
Whiting	70	----------	6, 307	1, 744	2	8, 123
Lobsters	5, 513	126	1, 680	1, 696	702	9, 717
Crabs	171	4	1, 751	50	10	1, 986
Clams	3, 577	36	3, 765	515	68	7, 961
Oysters	----------	----------	698	2, 584	8, 020	11, 302
Scallops	296	----------	698	271	2	1, 267
All other	388	----------	3, 557	1, 654	5, 926	11, 525
Total	116, 706	448	243, 364	20, 535	25, 769	406, 822

[1] Including shoremen and transporters directly connected with fisheries.

Source: U. S. Bureau of Fisheries.

It has been pointed out that some of the important species of fish and shellfish have been yielding diminishing quantities of product, and others have responded to increased demand with larger yields. In the following table are shown the total net results of these and other changes.

OPERATIONS AND CATCH OF NEW ENGLAND FISHERIES, 1888–1924

Year	Fishermen	Fishing vessels	Fishing boats	Catch	
				Thousands of pounds	Value in thousands of dollars
1888	26,959	1,543	11,418	572,908	9,860
1898	22,367	1,427	10,557	393,458	9,682
1902	24,031	1,479	11,405	534,075	12,406
1908	21,770	1,620	12,627	530,029	15,139
1919	17,847	978	10,364	467,340	19,839
1924	15,285	777	10,022	406,822	18,818

Source: U. S. Bureau of Fisheries.

The significant trends brought out by these figures are (1) the distinct decrease in number of fishermen; (2) an equally distinct decrease in number of vessels; (3) a relatively slight decrease in number of boats; (4) a decrease in the total catch; and (5) a very marked increase in the value of the catch. From this it would appear that in spite of decreased man power and a numerically smaller fishing fleet the catch is being maintained at a fairly horizontal level, apparently because of increased efficiency of the personnel and apparatus of fishing. Furthermore, while the size of the catch has remained virtually the same its value has almost doubled. General price changes account for practically all the general increase in the value of the New England fish catch. As might be expected, it is found that the return per fisherman has increased at a distinctly greater rate than have general prices.

In summary, it appears that the New England fisheries have practically reached the point where increased production of certain species is offset by decreased production of others, thus establishing a virtually horizontal level. The increased efficiency of operations, however, has permitted an upward trend in the real value of products per person engaged. Barring excessive depletion, there seems reason to believe that the return per man can continue to increase at a rate in excess of average prices, thus constituting a real gain to the industry.

WHOLESALE FISH TRADE

The wholesale trade consists of buying and selling fishery products, preparing fish into fillets, steaks, and pan-dressed products for the package trade, shucking oysters, and impounding lobsters. The wholesale fish trade of New England in 1924 was carried on by 200 establishments, which employed 1,922 persons, who received $2,157,537 in salaries and wages. The volume of this business conducted in the various States is shown in the following table.

WHOLESALE FISH TRADE OF INDIVIDUAL NEW ENGLAND STATES IN 1924

State	Establishments	Persons engaged	Wages and salaries
Maine	54	271	$188, 620
New Hampshire	1		
Massachusetts	103	1, 077	1, 566, 654
Rhode Island	25	217	173, 604
Connecticut	17	357	228, 659
Total	200	1, 922	2, 157, 537

Source: U. S. Bureau of Fisheries.

FRESH AND FROZEN FISH

Boston and Gloucester, Mass., and Portland, Me., named in order of their importance, are the main points where the wholesale trade in fresh and frozen fish is carried on. Wholesale dealers are also located at Provincetown, Nantucket, and New Bedford, Mass.; Newport, R. I.; and New London, Conn. In addition, one or more wholesale dealers are usually located in practically every seacoast town suitable for the safe harboring of vessels.

At Boston is located the famous Fish Pier, which is considered the most modern pier in the United States for the accommodation of fishing vessels and the fresh and frozen fish trade. The pier, constructed of brick, stone, and concrete, is 1,200 feet long and 300 feet wide. The majority of the wholesale fish dealers in Boston are located there, as well as the Boston Fish Exchange and a cold-storage plant for fishery products. Shares of boats and vessels unloaded at the pier are sold through this exchange in much the same manner as stock is traded on the New York Stock Exchange. During 1928 some 218,000,000 pounds of fresh and salt fishery products valued at nearly $9,000,000 passed through the exchange.

While the Fish Pier is the most modern of its kind. it leaves much to be desired in the way of efficient handling and conveying of the products from vessels to the establishments on the pier. Fish are unloaded from the vessels to the dock, largely by hand, in a slow and laborious fashion, consuming much more time than is proper in handling such a perishable product. From the dock's edge the fish are carted by hand to the various buying houses. When originally occupied in 1915, the annual landings were 100,000,000 pounds; now twice as much must be handled with the same facilities, resulting in serious congestion. The problem of devising and installing automatic unloading and conveying equipment is imminent and must be solved in the near future.

Gloucester, although having no central fish pier, ranks second in importance as a fish port. This port is the center of the salt-fish industry, which formerly was much more important than at present. In late years, because of the increased demand of the consumer trade for fresh or frozen fish, the handling of fresh fish and the canning of fishery products comprise a large proportion of the business of this port. During 1928 nearly 42,000,000 pounds of fresh and salted fishery products, valued at nearly $1,500,000, were landed by fishing vessels at Gloucester.

Portland, the third port in importance, has shown considerable revival, largely because of improved facilities for the distribution of fishery products. During 1928 about 18,000,000 pounds of fresh and salted fishery products, valued at nearly $600,000, were landed at Portland.

A radical departure in the method of merchandising fresh and frozen fish during recent years has given the fish business an impetus which promises to revolutionize the trade. This new method consists of placing the edible portion of the fish in unit packages of suitable size for retail distribution. Fish packed in this manner are known as package fish. Package fish are prepared at points of production, and are packed in containers and shipped in various types of cases, with or without the use of ice, depending upon the character of the product and the method of shipping.

As a result many establishments that in former years bought and sold only fresh or frozen fish have now taken on the aspect of cutting and packing concerns. The majority of these fish cutting and packing plants are located in Boston, Gloucester, and Portland. They are not confined, however, to the larger cities, and some firms desiring to be near points of production have opened large plants in smaller fishing towns, such as Provincetown, Mass., and Groton, Conn.

The capital required in erecting plants of this design is many times that necessary for carrying on a buying and selling organization, and the number of employees required is also much larger. While no accurate statistics are available on this trade, it is interesting to note that it began in 1921, in a small way, at Boston, and in 1928 there were 51 firms engaged in the trade in the New England States. Although many of these were previously wholesale dealers, a considerable number of the firms are new to this field, an indication that capital from other sources is entering the fish industry.

The combined production of package fish in the New England States and New York amounted to 61,913,000 pounds in 1928, valued at $9,262,000, which is 95 per cent of the production in the United States. By far the larger part of this production was of fillets. Among the species, packaged haddock made up 92 per cent of the total amount.

That New England plays an important rôle in supplying the Nation with fresh and frozen fish was revealed by a study of the distribution by wholesale fish dealers at Boston during September, 1922. Boston dealers in that month distributed more than 12,000,000 pounds of fishery products to points in 35 States, the District of Columbia, and Canada. Of the quantity distributed during that month Massachusetts consumed 56 per cent; New York, 19 per cent; Pennsylvania and Rhode Island, 5 per cent each; Connecticut, 4 per cent; New Hampshire, 2 per cent; Illinois, Maryland, Canada, and Maine, 1 per cent each; and the remainder went to points in 26 States. While no later comprehensive data are available pertaining to the distribution of fish from Boston, it is believed that during the past few years fish from that port have been given a wider distribution, largely as a result of the merchandising of package fish.

OYSTERS AND LOBSTERS

The wholesale trade in oysters includes shucking and marketing. Many of the firms in this business also operate oyster farms and own and operate vessels for the taking of oysters. The product of this region is marketed largely in New England and in the Middle Atlantic States, although quantities are shipped to points in the Middle West.

The wholesale trade in lobsters consists of buying, impounding, and selling. Firms handling lobsters do not usually make a practice of handling fish or other fishery products. They obtain lobsters in times of plenty and impound the surplus for marketing in times of scarcity. The pounds, or inclosures where lobsters may be kept alive but confined in the sea for some months, play an important part in the New England lobster industry. The dealers buy when the price is low and draw upon these impounded stocks at will. The pounds are filled twice a year—in September and October for the trade up to about March 20, and again in May and early June for the trade from the middle of July to the 1st of September. This phase of the industry makes an uneven seasonal catch available for the demand at all seasons of the year.

For impounding, dealers use large inclosed floats of wooden construction which are known as "lobster cars." In impounding lobsters considerable capital is tied up both in cars and in stocks. Additional labor is also necessary to feed and care for the impounded lobsters. During recent years no lobsters have been canned in the United States, as they are more valuable when sold fresh.

Lobsters are marketed largely in New England and throughout the Eastern States, but quantities have been shipped west as far as the Pacific States. Dealers in Portland, Me., ship live lobsters to St. Louis, Kansas City, Portland, Oreg., and even to Florida. Boston dealers ship to a greater number of points, the distribution in September, 1922, covering 27 States.

CANNING AND PRESERVING FISH

The canning and preserving of fishery products[3] is of considerable importance in the New England States. Their output is about one-fourth of the total for the United States exclusive of Alaska. In 1924 there were 200 establishments, employing 6,600 persons and producing about $14,250,000 worth of goods. Figures for 1928 are available on the quantity and value of canned goods and certain by-products, as shown in the next table.

FISH CANNING

Of these canning industries the most important is sardine canning in Maine. Most of the factories are located in Eastport and vicinity, convenient to the rich young-herring fisheries of the Passamaquoddy Bay region. About 75 per cent of the fish used in the vicinity of Eastport and Lubec are taken in Canadian weirs. As a rule, the fish are purchased from Canadian fishermen by representatives of the canneries, are transported in American-owned boats manned by Americans, and are entered free of duty as the product of American fisheries.

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[3] See also discussion of canning and preserving in manufacturing section of this report, p. 542.

The operation of the canneries is seasonal, depending on the runs of fish. In general, there are two periods of abundance—the spring run, which begins late in April and continues until about the middle of June, and the fall run, beginning in August and continuing throughout the fall months. Usually the fall run consists of fatter and more desirable fish and is considered the more important of the two. Scarcity of fish, poorness in quality, or unsatisfactory markets may shorten the season. These factors cause considerable variation from year to year.

NEW ENGLAND PRODUCTION OF CANNED FISHERY PRODUCTS AND BY-PRODUCTS IN 1928

Product		Quantity	Value
Canned products: [1]			
Sardines	cases	2, 055, 763	$8, 076, 546
Clams, clam chowder, etc	do	265, 217	990, 718
Miscellaneous	do	220, 251	1, 742, 533
By-products:			
Fish meal, scrap, and waste	tons	15, 893	774, 833
Glue	gallons	481, 305	1, 166, 236
Fish oils	do	639, 487	356, 930
Miscellaneous [2]	pounds	5, 778, 286	185, 577
Total			13, 293, 303

[1] The pack of sardines has been converted to the equivalent of quarter-pound cans, 100 to the case; that of clam products, to No. 1 cans, 48 to the case; and that of miscellaneous canned products, to 1-pound cans, 48 to the case.

[2] Consists of herring skins and scales, kelp products, isinglass, and oyster-shell products.

Source: U. S. Bureau of Fisheries.

Canning operations include bringing in the fish; distributing the fish upon grates for drying; steaming and drying; cutting and packing the fish in cans; addition of oils or sauces; sealing the covers; processing; cleaning; testing; labeling; and boxing. Much of this work is accomplished mechanically, but considerable hand labor is required, particularly in packing the fish in cans. Large numbers of girls and women are employed for the latter operation.

The product consists chiefly of low-priced sardines packed in cottonseed oil in quarter-pound cans. They are marketed largely in the mining regions and industrial centers, especially among the foreign population of limited means, and mainly through channels where price is of greater moment than quality.

The marketing of the product on a price basis rather than a quality basis is probably the chief obstacle to the expansion of the sardine industry. Our imports of higher grade sardines amount to nearly half the annual production in Maine. Since it has been demonstrated that sardines of equal quality can be put up in Maine (a few canneries are now packing such high-grade sardines) there appears to be a great opportunity for development of this phase of the industry.

The canning of clams, clam chowders, and other clam products is an industry of some importance in the State of Maine. In some cases the canners of sardines also pack clam products. Many of the clam plants are small, and they are somewhat widely scattered along the coast.

In Massachusetts and Maine there are a few establishments which produce a wide variety of canned fishery products derived from the flesh and roe of fish, often mixed with other food products. Some of these specialty items are finnan haddie, fish flakes, fish cakes, haddock chowder, smoked herring, mackerel, and haddock roe. Many of these are sold under special trade names. These products furnish an outlet for portions of fish otherwise wasted, and stabilize the business by absorbing surpluses when the market is glutted. This business has developed rapidly in recent years and promises to continue its increase. Illustrative of the growth in the output of these specialties are the comparative figures of output, as follows:

ANNUAL PRODUCTION AND VALUE OF CANNED FISHERY PRODUCTS, 1921–1928

Year	Pounds	Value	Year	Pounds	Value
1921	3, 184, 017	$632, 044	1925	7, 515, 602	$1, 407, 038
1922	2, 718, 910	590, 075	1926	8, 307, 517	1, 464, 020
1923	3, 247, 017	491, 942	1927	8, 932, 189	1, 543, 184
1924	6, 689, 084	1, 219, 687	1928	10, 572, 048	1, 742, 533

SALTED AND SMOKED FISH

The preparation of salted and smoked fishery products is carried on by numerous plants located in Maine and Massachusetts. With the exception of a few in Gloucester, these are relatively small units and the total volume of the business is not large. In former days the salt-fish business was vastly more important, but the development of refrigeration, transportation, and canning methods has to a large degree effected the displacement of salt fish by fresh, frozen, and canned fishery products. The following tables give detailed statistics of salt and smoked fish in New England.

SALT-FISH INDUSTRY AND PRODUCTS OF MAINE AND MASSACHUSETTS IN 1924

Item	Maine		Massachusetts		Total	
Plants	37		27		64	
Persons engaged	451		534		985	
Wages paid	$338, 288		$536, 425		$874, 713	
PRODUCTS	*Pounds*	*Value*	*Pounds*	*Value*	*Pounds*	*Value*
Alewives	603, 038	$13, 408	53, 000	$5, 300	656, 038	$18, 708
Cod	5, 675, 886	454, 055	10, 591, 395	1, 543, 368	16, 267, 281	1, 997, 423
Cod, boneless	611, 239	122, 248	2, 800	375	614, 039	122, 623
Cusk	161, 976	5, 403	478, 556	30, 020	640, 532	35, 423
Cusk, boneless	1, 079	162	----------	----------	1, 079	162
Haddock	1, 143, 750	46, 597	2, 983, 806	236, 288	4, 127, 556	282, 885
Haddock, boneless	5, 400	702	----------	----------	5, 400	702
Hake	4, 074, 213	153, 606	672, 963	38, 448	4, 747, 176	192, 054
Herring	32, 330	755	738, 280	36, 826	770, 610	37, 581
Mackerel	----------	----------	2, 129, 393	192, 045	2, 129, 393	192, 045
Pollock	682, 500	27, 614	759, 668	65, 967	1, 442, 168	93, 581
Shad	5, 000	350	----------	----------	5, 000	350
Cod cheeks, tongues, and sounds	6, 268	503	69, 029	5, 502	75, 297	6, 005
Total	13, 002, 679	825, 403	18, 478, 890	2, 154, 139	31, 481, 569	2, 979, 542

Source: U. S. Bureau of Fisheries.

Smoked-Fish Industry and Products of Maine and Massachusetts in 1924

Item	Maine		Massachusetts		Total	
Plants	47		17		64	
Persons engaged	432		181		613	
Wages paid	$93, 439		$232, 965		$326, 404	
PRODUCTS	*Pounds*	*Value*	*Pounds*	*Value*	*Pounds*	*Value*
Alewives	119, 460	$7, 900			119, 460	$7, 900
Finnan haddie	1, 113, 076	131, 391	1, 252, 241	$109, 036	2, 365, 317	240, 427
Halibut			39, 966	7, 939	39, 966	7, 939
Herring:						
Bloaters	384, 005	40, 387	1, 669, 998	139, 700	2, 054, 003	180, 087
Lengthwise	49, 645	4, 172			49, 645	4, 172
Medium scale	163, 795	14, 690			163, 795	14, 690
Boneless	1, 782, 790	257, 417			1, 782, 790	257, 417
Plain or kippered			3, 251, 000	190, 610	3, 251, 000	190, 610
Whole	58, 091	10, 023			58, 091	10, 023
Russian sardines	72, 000	2, 400			72, 000	2, 400
Other fish			400, 500	98, 524	400, 500	98, 524
Total	3, 742, 862	468, 380	6, 613, 705	545, 809	10, 356, 567	1, 014, 189

Source: U. S. Bureau of Fisheries.

INCOME OF PERSONS ENGAGED IN FISH INDUSTRY

FISHERMEN

It is exceedingly difficult to ascertain the income of fishermen. A few enterprises, such as the operation of vessels by large firms, are on a wage basis. For the most part, however, the fisherman's income depends on the proceeds from the sale of the fish catch. On the larger vessels compensation is on a share basis. Operating expenses are first deducted, and the remainder is divided into shares, several going to the owner, several to the captain and to the engineer, and one to each member of the crew. Shares are usually divided after each trip, and a crew's share of more than $100 each for a week's trip may be regarded as unusually high. In smaller boat fisheries individual fishermen or partners own and operate on a profit basis, sometimes employing other fishermen on wages or shares. Since the sharing system has many modifications, and all depends on the fishing success, it is virtually impossible to gauge the income or purchasing capacity of fishermen. There are always some operating at a loss, many operate at small profit, and some get very high returns.

Though it is impossible to obtain an estimate of fishermen's incomes, some idea of purchasing capacity may be gained by recalling that the annual value of fishery products in New England is about $19,000,000. This amount is spent for the operation and replacement of vessels, boats, and gear, and for the personal expenditures of fishermen and their families.

WHOLESALE TRADE EMPLOYEES

From the table on page 86 it may be seen that in the wholesale fish trade 1,922 persons were employed and that $2,157,537 was paid in salaries and wages. From this it may be calculated that the average per person is $1,120. This figure, however, is too low, since the 1,922 persons include proprietors and firm members, for which no compensation was reported. It is estimated that the average is more nearly $1,200.

CANNING AND PRESERVING INDUSTRY

There were 6,608 persons employed by the canning and preserving industry in 1924, and $2,853,414 was paid in wages, according to Bureau of Fisheries reports for that year. As in the table on the wholesale trade, the figures for number of persons include proprietors and firm members, whose compensation does not appear in the statistics. For more accurate information on this subject the following table has been prepared from census figures. These probably give good averages, but the totals are not complete, since all enterprises with production under $5,000 annually have been excluded. Since there are many small firms engaged in salting and smoking fish, this omission is of some importance. Furthermore, in Maine the employment in sardine canneries is seasonal, six months probably being the average duration. The low earnings of the women sardine packers in Maine are doubtless responsible for the low average in that State.

EMPLOYMENT IN THE FISH CANNING AND PRESERVING INDUSTRY IN 1927

Item	Maine	Massachusetts	Total
Proprietors and firm members	27	9	36
Salaried officers and employees	165	227	392
Salaries	$245,682	$404,021	$649,703
Average salary	$1,489	$1,780	$1,657
Wage earners (average number)	1,888	917	2,805
Wages	$904,742	$1,014,558	$1,919,300
Average wage	$479	$1,106	$684

Source: U. S. Bureau of Fisheries.

Part II.—TRANSPORTATION, POWER, AND FUEL

NOTE.—Assistance in compiling the data on transportation was given by Edwin Bates and R. J. McFall of the Department of Commerce.

RAIL AND WATER TRANSPORTATION

The purpose of this section is to show the facilities available for connecting the freight traffic of New England with the rest of the country; it is thus confined to a consideration of the external[1] tie-up of the region's transportation structure.

RAIL GATEWAYS

Because of the region's location, the rail routes that tie New England to the rest of the country play an especially vital rôle in its industrial life. Dependence in large measure on regions to the west and south, for raw materials, for fuel, and for market outlets, gives unusual importance to the cost of transportation. The fact that the volume of inward-moving fuel and raw materials greatly exceeds that of outward shipments—chiefly manufactured goods of relatively small volume and high value—is inevitably reflected in the general level of freight rates, on account of the preponderance of one-way revenue-freight traffic.

The bulk of rail traffic moves into and out of New England through five major gateways. One of these connects the rail lines that converge in the vicinity of Albany, N. Y., with the two main rail systems—Boston & Maine and Boston & Albany—that serve northern and central New England, providing through traffic with the West across New York State. For north and south traffic, connecting lines link these with lines traversing southern New York State and Pennsylvania. About 42 per cent of New England's total tonnage, both inbound and outbound, moves through the gateways that pierce the middle-western boundary of New England, opposite the Mohawk Valley.

One of the principal rail gateways into southern New England is the route along Long Island Sound, over the New York, New Haven & Hartford system, through New York Harbor, where connection is made with various trunk lines converging in New York City and providing access to the interior of the country westward and southward. There is a great concentration of traffic through this gateway, both for all-rail traffic to and from the interior and for water shipments through the port of New York. About 22 per cent of New England's inbound rail movement and 25 per cent of its outbound movement are through this gateway.

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[1] The rail and water facilities within the New England region are discussed in Chapter VIII of The Commercial Structure of New England, published separately as Part II of The Commercial Survey of New England (Domestic Commerce Series No. 26, U. S. Department of Commerce). The nature and volume of commodity movements into and out of New England over the various boundaries are presented in The External Trade of New England. (Domestic Commerce Series No. 22.)

There is also an important group of lines converging at Maybrook, N. Y., crossing the Hudson River at Poughkeepsie and entering New England north of the Sound region, thus avoiding the traffic congestion of the New York district. A substantial portion, about 18 per cent of the inbound traffic and 10 per cent of the outbound traffic, enters and leaves New England through Maybrook.

A lesser volume of traffic moves into and out of New England through the gateways of northern New York and Vermont. Such traffic comprises about 10 per cent of the inbound and about 15 per cent of the outbound rail shipments.

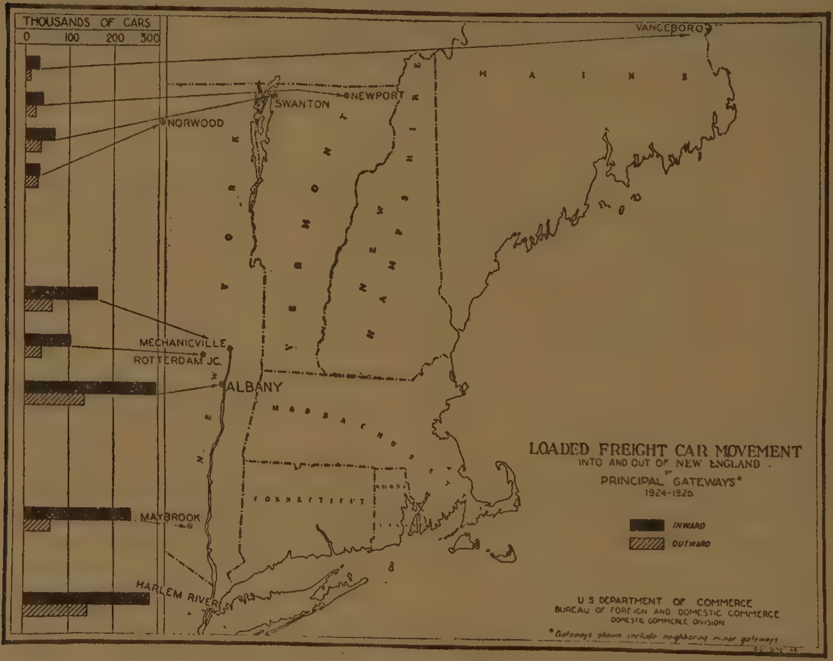
THOUSANDS OF CARS
0
100
200
300
VANCEBORO
MAINE
NEWPORT
SWANTON
NORWOOD
MECHANICVILLE
ROTTERDAM JC.
ALBANY
MAYBROOK
HARLEM RIVER
CONNECTICUT
RHODE I.
LOADED FREIGHT CAR MOVEMENT
INTO AND OUT OF NEW ENGLAND
BY
PRINCIPAL GATEWAYS*
1924-1926
INWARD
OUTWARD
U S DEPARTMENT OF COMMERCE
BUREAU OF FOREIGN AND DOMESTIC COMMERCE
DOMESTIC COMMERCE DIVISION
*Gateways shown include neighboring minor gateways

Figure 5

Besides these all-domestic routes, there are several routes by which traffic moves over the Canadian lines to the Middle West by way of the Great Lake region. They account for about 6 per cent of both the inbound and the outbound rail movement of New England. These northern routes play a competitive rôle and are a factor in fixing the rates between New England and the Middle West. They provide an all-rail differential route to the Middle West from Long Island Sound at New London over the Central Vermont Railway via St. Albans and the Canadian National Railway Lines. There is also a differential route over the Boston & Maine via Newport, Vt.

The relative importance of these different gateways in the loaded freight-car movement into and out of New England in 1926 is shown graphically in Figure 5.

FREIGHT RATE STRUCTURE

The present freight-rate structure of the country has developed out of past experience, under conditions existing when rates were determined solely by competition. New England's favored location regarding water transportation has been an important factor in traffic with regions where competitive routes are offered.

Between distant points of origin and of destination the through freight rates for the country are based upon relations between the different territories into which the carriers, through their regional freight associations, have divided the United States. In each of these the schedules vary for different commodity classifications, and there are also separate schedules for volume movement of individual commodities. While the rate structure for New England in general applies alike to inbound and to outbound movements, there are special distinctions to be noted in certain areas. Westbound rates between New England and Central Freight Association territory are lower than the eastbound all-rail rates. Transcontinental rates and rates to southwestern territory are the same in both directions.

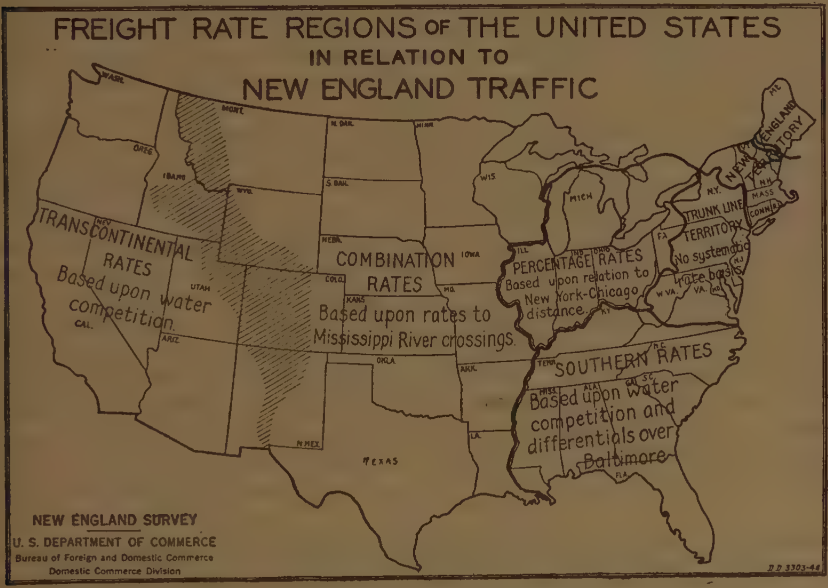
FREIGHT RATE REGIONS OF THE UNITED STATES
IN RELATION TO
NEW ENGLAND TRAFFIC
WASH.
MONT.
N. DAK.
MINN.
OREG.
IDAHO
WYO.
S. DAK.
WIS.
MICH.
N.Y.
ME.
NEW ENGLAND TERRITORY
N.H.
MASS.
CONN.
R.I.
TRUNK LINE TERRITORY
No systematic rate basis
N.J.
PA.
TRANSCONTINENTAL RATES
Based upon water competition.
NEV.
UTAH
CAL.
NEBR.
COMBINATION RATES
Based upon rates to Mississippi River crossings.
IOWA
COLO.
KANS.
MO.
ILL.
IND.
OHIO
PERCENTAGE RATES
Based upon relation to New York-Chicago distance.
W. VA.
VA.
MD.
KY.
ARIZ.
OKLA.
ARK.
TENN.
N.C.
SOUTHERN RATES
Based upon water competition and differentials over Baltimore
MISS.
ALA.
GA.
S.C.
N. MEX.
TEXAS
LA.
FLA.
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division
D.D. 3303-44

Figure 6

The general rate territories into which the United States is divided are shown in Figure 6. In each of these divisions there is a distinctive basis for constructing rate schedules.

BREAK-UP OF TERRITORY

For westbound traffic the whole region may be taken as a single unit. Traffic going west of Buffalo, Pittsburgh, and Wheeling takes the Boston rates, no matter what part of New England is its origin, except for northern Maine.

On eastbound traffic from points west of the Buffalo line, the Boston rates apply to all of Connecticut, Rhode Island, and Massachusetts, to the southern part of Maine and New Hampshire, the southern and western parts of Vermont, and to points on the Grand Trunk line as far east as Portland. For eastern and northern Maine the eastbound rates are generally based on those for Rockland, Me. On traffic interchanged with the southeastern States in either direction certain parts of New England pay more than the Boston rates.

Totally different systems of rate making have developed to apply to traffic interchanged with different large sections of the country. These rate systems apply with fair uniformity to movements starting or terminating in any part of each of these large territories.

RATES TO NEAR-BY TERRITORY

Between New England and the region immediately to the west—known as trunk-line territory, extending from the New England boundary to the Buffalo-Pittsburgh-Wheeling line—the freight-rate system is very complex for both inward and outward traffic. Since this region is so close to New England, there is great variation in the distances which individual shipments have to move between origin and destination. Rates applied to individual cases are based roughly upon the distance of haul.

For traffic moving between New England and points west of trunk-line territory (that is, Central Freight Association territory) there is some distinction between eastward and westward shipments. On westward movements the six New England States are generally considered as a unit. For freight originating in any part of New England and destined to points west of trunk-line territory the rate is approximately the same as that from Boston.

For traffic moving eastward from points west of trunk-line territory, except from transcontinental and southern territory, New England is divided into two rate areas. The greater part of New England takes the rate for Boston. To points in eastern and northern Maine and in northern Vermont and New Hampshire the rates are generally based on those to Rockland, Me.

PERCENTAGE RATE AREA

In the region west of the trunk-line territory, freight rates are built on a highly systematized basis graduated according to distance, designated as the percentage system. The region includes all the area north of the Ohio River, extending west to the Mississippi and north to the Illinois State boundary, and takes in the States of Ohio, Indiana, Illinois, most of Michigan, and the southern part of the Province of Ontario (that is, the area included in Central Freight Association territory). Special areas containing the leading points on the west shore of Lake Michigan are included. The rates to Minneapolis and St. Paul and to the leading cities of southern Wisconsin are closely related to the percentage system.

The rates between Chicago and New York are the yardstick for rate making on traffic interchanged between this area and the whole northeastern seaboard. Rate levels are determined primarily by the percentage relation between the New York-Chicago mileage and the distance from various zones in this area to points in the East. In this territory the freight rates to and from New England increase with considerable regularity according to the distance.

DIFFERENTIAL RAIL RATES

Differential rail rates, lower than the standard all-rail rates by defined amounts, are also available for traffic moved between New England and points in the Middle West, extending as far westward as Montana. These lower rates are given over routes which are somewhat longer, or slower, than the standard routes. The routes include ocean and rail, via Atlantic ports; rail and lake, via the Great Lakes; and all-rail, via longer rail routes, particularly on the Canadian railways. The influence of these routes has been of considerable importance to New England.

COMBINATION RATES WITH THE GREAT PLAINS

Traffic interchanged with the Great Central Plain, lying between the Mississippi River and the Rocky Mountains, generally moves on what are known as "combination rates." These are a combination of the regular charge to the western edge of the territory covered by percentage rates, plus another rate applying between that line and the particular receiving or shipping location in the West. The portion of the entire rate which applies to the eastern part of the haul may be the percentage rate on Chicago; in the central and the northern portion it is that for the "Mississippi crossings." The portion of the rate applying to the western part of the haul may be the regular rate between the river and the western location involved; or it may be a somewhat lower rate used solely for combination, and known as a "proportional rate."

In almost all cases the lowest possible combination of rates for any routing applies to all rates. Since the rates increase progressively over various distance zones westward from the Mississippi, the charges between various points in this western territory and New England are based roughly upon the distance involved. A maximum limit upon rates applying to points on the western edge of this territory is imposed by the ruling that they can not be higher than transcontinental rates.

Through rates to the Southwest (Arkansas, Louisiana, Oklahoma, and Texas) were established in the summer of 1928.

TRANSCONTINENTAL RATES

The transcontinental rate system applies to all traffic between the East and the Pacific coast territory, bounded roughly on the east by the Rocky Mountain divide. This system has been built upon the rate structure for traffic interchanged between the East and the Pacific coast water terminals. The rates to the terminals, in turn, have grown out of competition between the railways and the water carriers. It was formerly true that generally the lowest rates applied to much of the traffic moving westward to the actual terminals. Rates to the intermountain points, where there was less competition, tended to exceed the terminal rates by the amount of the local rate for the back haul from the coast. To-day, while the rates to the coast terminals are the basis for transcontinental rates, the charges on traffic interchanged in each direction with the intermountain points are shaded downward from this basis, rather than upward.

In Figure 7 is shown the competitive position of the eastern two-thirds of the country in relation to all-rail transcontinental traffic with California terminals. The chart at the base of the map gives rate comparisons for first-class freight moving from the different lettered areas in the East. While this map is constructed for westbound class traffic to California terminals, it is fairly representative of all transcontinental traffic interchanged in either direction with points west of the Rockies. With some rates on special commodities there is less breaking up of the eastern territory, the same rate applying over broader "blanket zones." For certain commodities moved eastward the rates are blanketed over the entire country east of the Rockies.

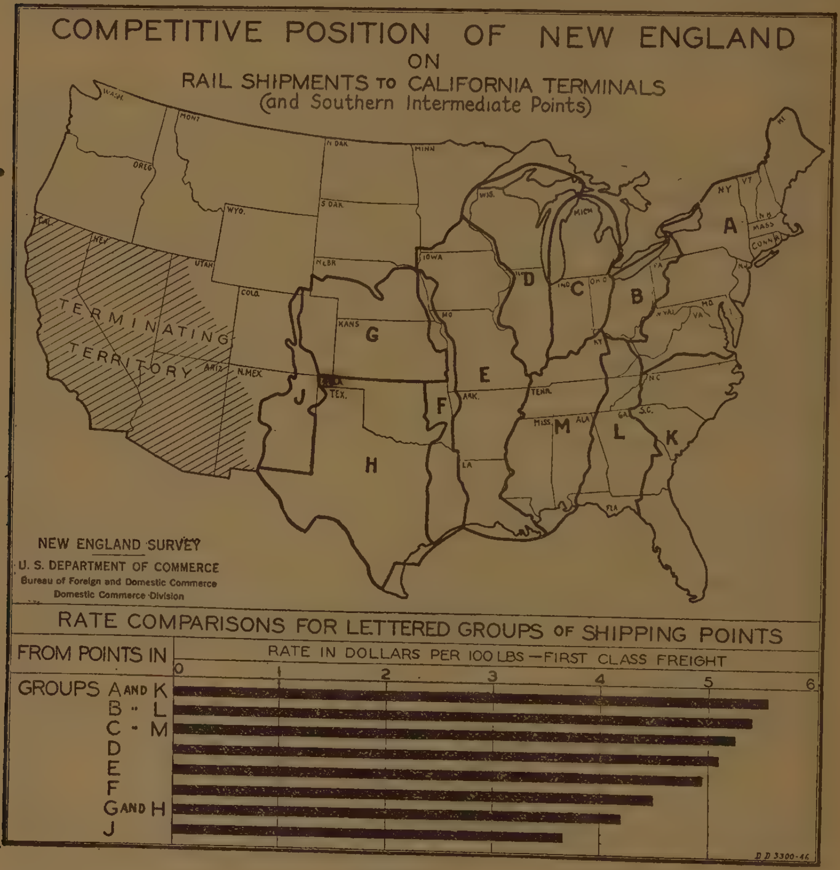
COMPETITIVE POSITION OF NEW ENGLAND
ON
RAIL SHIPMENTS TO CALIFORNIA TERMINALS
(and Southern Intermediate Points)
WASH
MONT
OREG
N DAK
MINN
S DAK
WYO
CAL
NEV
UTAH
NEBR
IOWA
COLO
KANS
MO
WIS
MICH
IND
OHIO
NY
VT
NH
ME
MASS
CONN
PA
W VA
VA
MD
KY
TENN
NC
SC
GA
ALA
MISS
ARK
LA
TEX
N.MEX
ARIZ
FLA
TERMINATING TERRITORY
A
B
C
D
E
F
G
H
J
K
L
M
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division
RATE COMPARISONS FOR LETTERED GROUPS OF SHIPPING POINTS
FROM POINTS IN
RATE IN DOLLARS PER 100 LBS—FIRST CLASS FREIGHT
0
1
2
3
4
5
6
GROUPS A AND K
B " L
C " M
D
E
F
G AND H
J
D D 3300-46

Figure 7

RATES TO AND FROM THE SOUTH

Rates on traffic interchanged between New England and the southern territory east of the Mississippi and south of the Ohio River have also grown out of a transportation situation in which water competition has played an important part. There, again, the cities enjoying water communication were formerly given lower rates than their surrounding territory. This practice has been changed in recent years, and now the tendency is for the rates published for the leading cities to apply also to all points in their neighborhoods. Thus, the South is broken up into various commercial areas for rate-making purposes. Within the past two years there has been a material adjustment in the rates from New England to southern territory, placing them more fully on a mileage basis.

FACILITIES FOR WATER TRANSPORTATION

In coastwise traffic to the Atlantic and Gulf ports water facilities antedate the railroads as a means for extending New England commerce to a wide market in the United States. The opening of the Panama Canal in 1914 doubled this advantage by extending its water traffic to include the Pacific coast regions. Cheapened water transportation has brought the coasts relatively closer together, at the same time that increased rail rates have moved the interior of the country relatively farther from seaboard.

Development of the trunk-line railroads and their extension across the continent in the latter half of the nineteenth century—in which New England capital and enterprise played a prominent part—diverted attention for a time from the advantages of New England's water facilities in domestic trade. By opening up the interior of the country to low-cost rail transportation an ever-increasing market was made accessible.

This water service is important also in the movement of manufactured products to the Pacific coast and into the Southwest. New England manufacturers forward a substantial portion of their products to the Pacific coast via the United States intercoastal conference lines, and into the Southwest via the Atlantic coastwise and Gulf steamship lines. The service compares favorably with all-rail routes with a 15-day schedule between New York and Los Angeles via the Panama Canal.

The increased cost of rail service in recent years and the congestion of traffic have given renewed emphasis to the advantages of water transportation and have directed attention to establishing the best balance between rail and water traffic. A large proportion of bulky commodities, such as fuel and raw materials for manufacture, in which low freight rates are more important than rapid movement, is adapted to this water traffic. The avoidance of rail congestion also makes the use of water facilities frequently an actual saving of shipping time.

The water facilities of New England may be considered according to regions concerned, as those for (1) local interchange between New England points, (2) interchange of traffic through the port of New York for domestic and foreign shipment, (3) interchange with the Atlantic and Gulf ports in domestic trade, (4) interchange with the Pacific coast, and (5) direct foreign traffic with non-American ports.

About four-fifths of all New England's water traffic is coastwise shipping, and less than one-fifth is foreign traffic. Of the coastwise shipping the greatest volume of movement is between New England and the Atlantic and Gulf ports.

MAIN ROUTES AND CONNECTIONS

Direct water service from Boston and Providence to Philadelphia, Baltimore, and Norfolk is given by the Merchants & Miners Transportation Co. The Clyde Line, the Ocean Steamboat Co., and the Eastern Steamship Line operate between Boston and southeastern ports. Water traffic from New England ports through the ports of Baltimore and Norfolk has a differential advantage over all-rail routes in a territory spreading out to the westward over much of the region north of the Ohio River, including Chicago and Duluth and extending westward to the Rockies.

The water route through Hampton Roads is of very great importance to New England industry, because over this route moves half the bituminous coal—upward of 10,000,000 tons annually—that is consumed by New England industries. This coal moves by rail from the mines of West Virginia to tidewater, and thence by vessel to New England ports, at rates below the all-rail rates from Pennsylvania mines. Minor quantities of coal move also from the more northern fields through the ports of Baltimore and Philadelphia.

Direct water connections through the South Atlantic ports of Charleston, Savannah, and Jacksonville are afforded by the Clyde Line, the Merchants and Miners Transportation Co., and the Savannah Line for commerce with the Southeastern States. The connection at Savannah with the terminal of the Illinois Central Railroad system provides also an Atlantic corridor to the Middle West, which brings the port of Boston into direct communication with this interior region. Combined water-and-rail rates with the South are fixed at certain differentials below the all-rail rates.

The Panama Canal brings the whole Pacific coast region, extending eastward to the Rockies, into a favorable position in which transportation rates for New England are materially less than the all-rail continental rates from points well in the interior. This intercoastal traffic by water is confined practically to a limited selection of goods which do not require rapid movement.

NEW ENGLAND POWER SITUATION

The high degree of industrialization in New England makes the matter of an adequate and economical power supply one of the vital factors in the continued development of this section in competition with other regions. New England has been passing through a period of pronounced growth and change in its power situation, generally parallel to the expansion throughout the country. The developments in this region have taken the following directions:

1. A change from private sources of steam and water power generated within individual manufacturing establishments to the use of purchased electrical energy provided by power companies.
2. The concentration and development of separate power units within central supply systems which serve the industrial users in a wide area.
3. Increased utilization of the natural water-power resources of the region, through the development of projects at new sites and through expansion of former units by enlarging reservoir capacities and increasing elevations to increase the efficiency of stream flow.

The plan of this section is first to indicate the extent of the total power requirements of New England industries, and to show the trend of growth in these over a period of years. Consideration is then given to the sources from which these power requirements are supplied, with the relative importance of fuel and water. The type of agencies which supply power to New England industries is then discussed, together with changes and trends in the relative importance of these sources and agencies.

Electrification of New England industry is considered in regard to its present volume and its recent trends. This includes consideration of the development of power interconnections by the linking up of central stations.

Water power is considered from the angle of total resources, its growth and present development, the extent of undeveloped water power, and the sources outside New England that may have significance to the industries of this section.

No exhaustive treatment of this highly technical engineering subject is attempted here. Various agencies have made surveys and reports on certain phases of New England power to which the reader is referred for more detailed information. The reports of the power commissions of some of the States, particularly in Maine, New Hampshire, and Massachusetts, cover this subject more fully than is possible in the present treatment. The most comprehensive and detailed of these studies is a general survey[2] of the New England power situation by the Associated Industries of Massachusetts, published in 1924.

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[2] Reference is made especially to the following reports: Superpower Study of the Northeastern Section of the United States, by the Federal Power Commission, 1924; Report of Associated Industries of Massachusetts Power Investigation Committee, 1924; Reports of New Hampshire Power Commission; Annual Reports of Maine Power Commission, especially that for 1918; a report by the New England Council in 1927, entitled "Power Interconnections."

POWER REQUIREMENTS AND EQUIPMENT

The total power requirements of the New England population would include not only the power for turning machinery in factories but also that used for street and municipal lighting, electric railways, the lighting of private dwellings, and electric power used on farms. The electrification of steam railways is also a growing factor in the change of power sources. No complete information is at hand to show the total consumption of power throughout New England. The only records of actual power consumption are those for purchased electric energy which passes through meters of public utility companies.

In the absence of records of power developed or consumed in manufacturing establishments, the only available indicator is the capacity in horsepower of the equipment used as prime movers. This is shown for census years by the United States Census of Manufactures, which classifies the capacity of prime movers, according to sources of power, under the headings of fuel burning, water driven, or operated by purchased electric current.

The rated capacity of all prime movers in manufacturing establishments of the six New England States in 1925 was approximately 4,350,000 primary horsepower and represented a little less than one-eighth of the total for all manufacturing industries of the United States. The importance of all power equipment in manufacturing establishments of the individual States is shown by the following table.

INSTALLED CAPACITY OF POWER EQUIPMENT IN NEW ENGLAND MANUFACTURING ESTABLISHMENTS IN 1925

State	Total primary horsepower	Per cent of New England
Massachusetts	2, 130, 503	46. 6
Connecticut	847, 395	18. 6
Maine	628, 941	13. 8
Rhode Island	410, 181	9. 0
New Hampshire	376, 373	8. 2
Vermont	172, 762	3. 8
Total	4, 566, 155	100. 0
United States total	38, 825, 681	----------
New England as per cent of United States	----------	11. 7

NATURE OF POWER EQUIPMENT

About 60 per cent of the power equipment in New England factories is operated by power generated within the individual establishments from fuel or water. The remainder is operated from electric current purchased from power companies or from other manufacturers.

Of the portion supplied from the individual power plants of manufacturers, slightly more than half is provided by steam or water power applied directly to the turning of machinery; and a little less than one-half is used to generate electric current within the establishment.

Fuel was used in 1925 as a source of power to operate 42.3 per cent of the equipment of private manufacturing plants, and water was the source of power for only 18 per cent, while internal-combustion engines comprise but 2 per cent. The following table shows for 1927 the relative importance of these different types of power equipment in the manufacturing establishments of each State. This is shown graphically for 1925 in Figure 8.

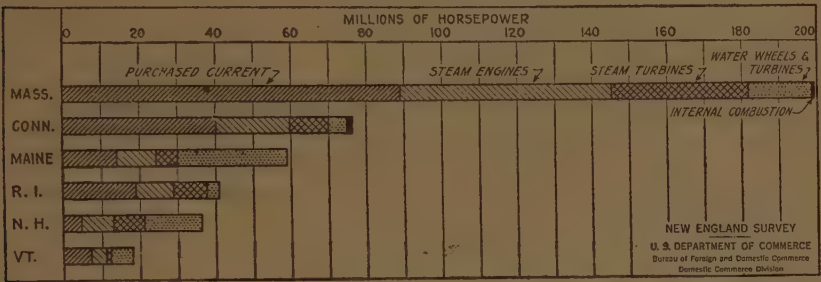


Figure 8.—Relative importance of various types of power equipment in New England manufacturing plants in 1925

TYPES OF POWER EQUIPMENT USED IN NEW ENGLAND MANUFACTURING ESTABLISHMENTS IN 1927

[Rated capacity in horsepower of all prime movers]

Source of power	Massachusetts	Connecticut	Maine	Rhode Island	New Hampshire	Vermont	Total New England	New England as per cent of United States
Fuel burning	944, 586	323, 561	150, 402	189, 385	163, 846	42, 469	1, 814, 249	10. 03
Steam engines	525, 659	167, 053	91, 554	94, 925	73, 570	32, 181	984, 942	9. 71
Steam turbines	409, 117	150, 391	57, 125	91, 260	87, 714	8, 327	803, 934	11. 85
Internal combustion	9, 810	6, 117	1, 723	3, 200	2, 562	1, 961	25, 373	2. 17
Water driven: Water wheels and turbines	163, 406	52, 571	317, 870	21, 558	154, 748	51, 705	761, 858	47. 66
Purchased current: Electric motors	1, 022, 511	471, 263	160, 669	199, 238	57, 779	78, 588	1, 990, 048	10. 40
Total, all sources	2, 130, 503	847, 395	628, 941	410, 181	376, 373	172, 762	4, 566, 155	11. 76
Each State as per cent of New England total	46. 66	18. 56	13. 77	8. 98	8. 24	3. 79	100. 00	---------
Per cent operated by each type:								
Fuel-burning equipment	44. 34	38. 18	23. 91	46. 17	43. 53	24. 58	---------	---------
Water-driven equipment	7. 67	6. 21	50. 54	5. 26	41. 12	29. 93	---------	---------
Purchased current	47. 99	55. 61	25. 55	48. 57	15. 35	45. 49	---------	---------

Source: U. S. Bureau of the Census.

There is conspicuous contrast among the individual States. In Maine more than half the power equipment is water driven. In New Hampshire and Vermont also water power is a large proportion of the total. In Massachusetts, Connecticut, and Rhode Island, however, less than 10 per cent of the power equipment in manufacturing establishments is driven by water. Purchased current is the power source for more than half the purchased equipment in Connecticut and for nearly half that of Rhode Island. In Massachusetts fuel is slightly less important than purchased current.

GROWTH IN POWER EQUIPMENT

The growth of the amount of power equipment installed in New England industries in the census years from 1869 to 1927, inclusive, is shown in the following table. In the two decades from 1869 to 1889 the total primary horsepower doubled. In the next 20 years, ended in 1909, it more than doubled. Since 1910 the growth has been fairly regular and continuous. The total rated capacity in 1925 was upward of 16.5 per cent greater than in 1910. In this same period, however, the expansion for the United States as a whole was relatively greater, amounting to more than 19 per cent.

The most significant facts in the recent development of New England's power equipment are (1) the great increase in equipment operated by purchased electric current since 1914, (2) the relatively stable position of water-driven equipment since 1909, and (3) a substantial falling off in the fuel-burning equipment of private industrial plants since 1914.

The installation of equipment using purchased electric current has increased 31.3 per cent in New England since 1914, as measured by horsepower capacity, in comparison with 30.7 per cent for the United States as a whole.

Changes in Total Power Equipment of New England Manufactures 1869–1927

Census year	Total primary horsepower[1]		New England as per cent of United States
	New England	United States	
1927	4, 566, 155	38, 825, 681	11. 8
1925	4, 349, 191	35, 772, 628	12. 2
1923	4, 151, 136	33, 094, 228	12. 5
1919	3, 796, 846	29, 504, 792	12. 9
1914	3, 124, 329	22, 437, 072	13. 9
1909	2, 715, 121	18, 675, 376	14. 5
1904	2, 125, 815	13, 487, 707	15. 8
1899	1, 792, 342	10, 098, 000	17. 7
1889	1, 156, 877	5, 939, 000	19. 5
1879	743, 106	3, 411, 000	21. 8
1869	514, 730	2, 346, 000	21. 9

[1] Includes equipment operated by purchased electric current.

Source: United States Biennial Census of Manufactures.

CHANGES IN SOURCES OF POWER

The next table shows the changes from 1904 to 1925 in the relative importance of fuel-burning and water-driven industrial equipment for New England as a whole.

Changes in Source of Power for New England Industrial Equipment, 1904 to 1925

[Percentage of total horsepower capacity]

Year	Generated in manufacturing establishments—		Purchased current
	From fuel	From water	
1925	42. 29	17. 88	39. 84
1923	43. 96	18. 34	37. 70
1919	50. 09	19. 69	30. 22
1914	61. 52	24. 25	13. 23
1909	62. 64	27. 89	9. 47
1904	64. 00	31. 00	5. 00

ELECTRIFICATION OF INDUSTRIES

The growth of the utilization of electric power is an important factor not only because of its effect upon the productive industries but because of its far-reaching effect in opening up a large market for electrical equipment and appliances. Every factory which installs electric power becomes thereby a market for motors and accessories. Every household which uses electric current is a potential market for numerous household appliances. Every farm so equipped finds various uses for electrically driven machinery.

The increased availability of electric power for manufacturing processes fosters the economical development of industry. It brings to isolated plants in small communities the advantage of economical power that is enjoyed in large industrial centers and thus tends to relieve the concentration of industry in the large centers. The accessibility of this power is particularly significant to the periodic and small-unit industries which do not have large power requirements. The steam engine and the water wheel could transmit power only by shafts or belts, hence mills had to be built as highly concentrated units. The ease of transmission of electrical power is tending to disperse industry instead of confining it to congested areas.

The increased electrification applies also to communities already served, in the improvement of service resulting from linking up small, separate units by interconnections of central stations. The wider distribution of power load thus made possible provides a more abundant and regular supply of power at individual points.

Development of interconnecting power systems increases the advantage to industrial users, not only because it assures specified amounts of power to meet stated requirements, but also because it provides continuity of supply which is available instantly day or night in abundant quantity to meet such additional load requirements as expanding business may make necessary.

USE OF PURCHASED CURRENT

New England industrial establishments in 1924 consumed 3,093,197,000 kilowatt hours of electrical energy. Of this total consumption, central power stations supplied 58.4 per cent, and 41.6 per cent was generated in private industrial plants. Thus, it is seen that central stations supply more than half of all the electrical energy consumed in New England manufacture.

In 1924 there were 1,038 private industrial plants in New England generating electricity, whose equipment had a total rating of 751,565 kilovolt amperes. In 1925 there were 330,093 electrically driven motors in the industrial plants of New England. About two-thirds of these were small motors with a capacity of less than 5 horsepower. Of this total number 63.5 per cent were driven by purchased current and the remaining 36.5 per cent were operated by current from privately generated sources.

OWNERSHIP OF CENTRAL STATION POWER PLANTS

Most of the electric power produced for sale in the New England States is generated by power companies and traction companies. In 1922 power companies produced 78 per cent of the New England total and traction companies 18 per cent. Municipal plants contributed only 2 per cent and private sources less than 1½ per cent of the total.

The volume of power generated in each State in 1922 by the different kinds of plants is shown in the following table, as reported by the Associated Industries of Massachusetts.

OUTPUT OF CENTRAL STATION POWER IN NEW ENGLAND STATES IN 1922

[Thousands of kilowatt hours generated]

State	Power companies	Traction companies	Municipal plants	Private sources	Imported	Total
Massachusetts	1, 422, 165	396, 295	48, 080	28, 070	------------	1, 894, 610
Connecticut	534, 612	185, 530	9, 068	1, 300	------------	730, 510
Rhode Island	346, 725	63, 800	------------	3, 040	------------	413, 565
Maine	284, 460	683	700	6, 637	12, 055	304, 535
New Hampshire	198, 608	------------	850	7, 567	------------	207, 025
Vermont	69, 440	3, 480	13, 415	6, 130	700	93, 165
Total	2, 856, 010	649, 788	72, 113	52, 744	12, 755	3, 643, 410
Percentage produced by each type	78. 4	17. 8	2. 0	1. 4	. 4	100

PUBLIC UTILITY POWER DEVELOPMENT

The production of electric power by central stations and public-utility companies in New England, according to reports of the United States Geological Survey, showed an increase of 51 per cent from 1920 to 1926. In this same period the production for the United States as a whole increased 69.4 per cent. It thus appears that although central-station development has made substantial growth in New England in the last few years, it has been surpassed by some other parts of the United States.

The production of central stations and public-utility companies in New England in 1920 was 7.81 per cent of the United States total; in 1926 it was 7 per cent; and in 1928 it was 6.78 per cent. Figures of the annual power production of New England and comparative figures for the United States are given in the following table.

ANNUAL ELECTRIC POWER PRODUCTION BY CENTRAL STATIONS AND PUBLIC-UTILITY COMPANIES OF NEW ENGLAND AND OF THE UNITED STATES, 1920–1928

Year	New England			United States	
	Millions of kilowatt-hours	Increase from preceding year	Relation to United States total	Millions of kilowatt-hours	Increase from preceding year
		Per cent	*Per cent*		*Per cent*
1928	5, 959	8. 9	6. 78	87, 850	9. 5
1927	5, 471	5. 9	6. 82	80, 205	8. 7
1926	5, 166	7. 1	7. 00	73, 791	12. 0
1925	4, 824	11. 3	7. 32	65, 870	11. 6
1924	4, 335	1. 4	7. 34	59, 014	6. 0
1923	4, 276	14. 6	7. 68	55, 674	16. 8
1922	3, 730	16. 1	7. 82	47, 659	16. 3
1921	3, 214	[1] 5. 7	7. 85	40, 976	[1] 5. 9
1920	3, 407	------------	7. 81	43, 535	11. 9

[1] Decrease.

Source: U. S. Geological Survey.

SOURCES OF ENERGY

Figures of the Geological Survey for the annual production of electricity by public-utility power plants show that approximately two-thirds of the total production, as measured by kilowatt-hours, is contributed from fuel and one-third from water power. Comparison of fuel sources and water sources from 1920 to 1928 by years is afforded for public-utility plants in the next table. It is noted that the increase in total power production has run almost parallel in these two sources. The proportions for the individual years show very little variation, but since 1926 there has been a pronounced increase in the relative importance of water sources.

Sources of Annual Production of Electricity by Public-Utility Power Plants in New England, 1920–1928

[Thousands of kilowatt-hours]

Year	Total	From water		From fuels	
		Total	Per cent of New England total	Total	Per cent of New England total
1928	5, 968, 843	2, 377, 869	39. 9	3, 580, 974	60. 1
1927	5, 470, 556	1, 989, 386	36. 4	3, 481, 170	63. 6
1926	5, 165, 955	1, 684, 790	32. 6	3, 481, 165	67. 4
1925	4, 823, 655	1, 637, 835	33. 9	3, 185, 820	66. 1
1924	4, 334, 553	1, 437, 012	33. 2	2, 897, 541	66. 8
1923	4, 275, 836	1, 253, 734	29. 3	3, 022, 102	70. 7
1922	3, 729, 873	1, 210, 475	32. 4	2, 519, 398	67. 6
1921	3, 214, 189	1, 038, 693	32. 3	2, 175, 496	67. 7
1920	3, 406, 712	1, 133, 910	33. 3	2, 272, 802	66. 7

Source: U. S. Geological Survey.

A report for the 12 principal power systems of New England for 1926, compiled by The Electrical World, showed that of the 61 power stations included in these 12 systems there were 19 fuel-burning plants, whose total rating of generators was 1.094,617 kilovolt amperes and 42 hydroelectric plants (of which 22 were in Maine) whose generators had a total rating of 323,005 kilovolt amperes. Thus, in the plants included in these principal power systems fuel was the source of energy for over 77 per cent of the total generator capacity, and water power was the source for less than 23 per cent. Of these fuel-consuming plants coal was the source for 92 per cent, and fuel oil for about 8 per cent.

SOURCES OF CENTRAL STATION POWER IN DIFFERENT STATES

The relative importance of fuel and of water in the production of electric power by central stations is shown for each State, as of 1922, in the following table.

SOURCES OF ELECTRICAL POWER GENERATED BY CENTRAL STATIONS IN NEW ENGLAND STATES IN 1922

State	Fuel		Water		Total, thousands of kilowatt-hours generated
	Thousands of kilowatt-hours generated	Per cent of total	Thousands of kilowatt-hours generated	Per cent of total	
Massachusetts	1, 504, 125	79. 39	390, 485	20. 61	1, 894, 610
Connecticut	579, 540	79. 33	150, 970	20. 67	730, 510
Rhode Island	406, 410	98. 27	7, 155	1. 73	413, 565
Maine	20, 080	6. 59	284, 455	93. 41	304, 535
New Hampshire	34, 525	16. 68	172, 500	83. 32	207, 025
Vermont	1, 800	1. 93	91, 365	98. 07	93, 165
Total	2, 546, 480	69. 89	1, 096, 930	30. 11	3, 643, 410

Source: Report of Power Investigating Committee, Associated Industries of Massachusetts.

It is seen that in 1922, 98 per cent of the power in Rhode Island was produced from fuel, and in both Massachusetts and Connecticut nearly 80 per cent was produced from fuel. These three States comprise the bulk of the power production by central stations, amounting to 83 per cent of the New England total from all sources and about 98 per cent of the total from fuel sources.

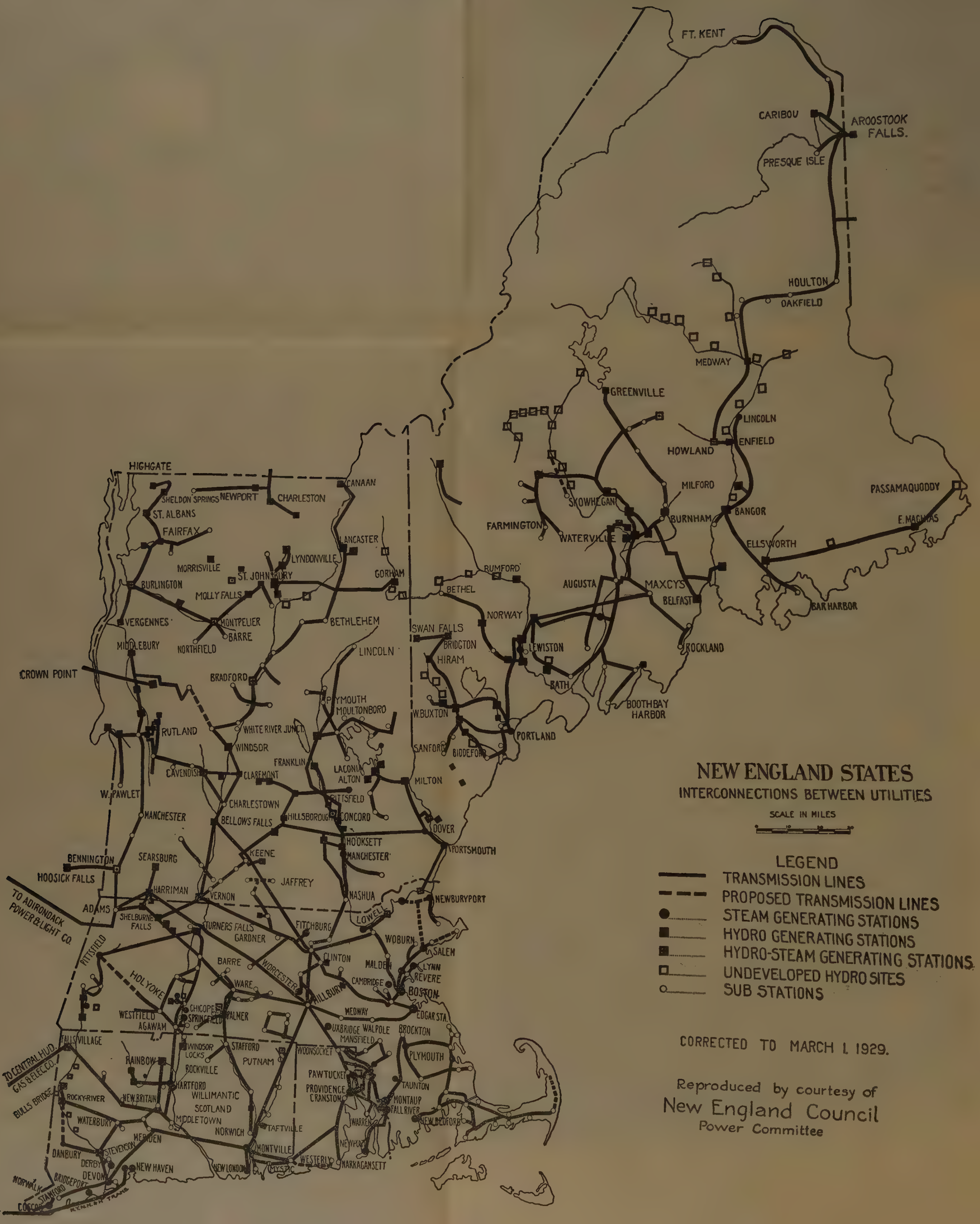
In contrast to this dependence on fuel in southern New England, in Vermont 98 per cent of the total production of central stations was from water, in Maine 93 per cent, and in New Hampshire 83 per cent. For all New England, according to these figures, 70 per cent of the total electrical power produced in central stations in 1922 was developed from fuel sources and 30 per cent from water.

The relative importance of coal and oil in generating electric power in the different States is shown from 1926 to 1928 in the following table.

COAL AND OIL CONSUMPTION BY PUBLIC UTILITY POWER PLANTS IN NEW ENGLAND STATES IN 1926–1928

State	Coal			Oil		
	1926	1927	1928	1926	1927	1928
	Short tons	*Short tons*	*Short tons*	*Barrels*	*Barrels*	*Barrels*
Massachusetts	1, 546, 952	1, 535, 025	1, 546, 906	582, 173	628, 072	398, 710
Connecticut	840, 303	824, 080	839, 538	1, 512	374	202
Rhode Island	348, 459	314, 441	328, 881	181, 975	167, 225	91, 613
Maine	1, 919	1, 933	1, 680	116, 517	30, 842	27, 281
New Hampshire	49, 143	33, 617	31, 232	1, 474	1, 555	2, 841
Vermont	184	407	------------	37, 052	30, 221	50, 028
Total	2, 786, 960	2, 709, 503	2, 748, 237	920, 703	858, 289	570, 675

Source: U. S. Geological Survey.


NEW ENGLAND STATES
INTERCONNECTIONS BETWEEN UTILITIES
SCALE IN MILES
LEGEND
TRANSMISSION LINES
PROPOSED TRANSMISSION LINES
STEAM GENERATING STATIONS
HYDRO GENERATING STATIONS
HYDRO-STEAM GENERATING STATIONS
UNDEVELOPED HYDRO SITES
SUB STATIONS
CORRECTED TO MARCH 1, 1929.
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SKOWHEGAN
BANGOR
BURNHAM
FARMINGTON
WATERVILLE
E. MACHIAS
ELLSWORTH
RUMFORD
AUGUSTA
MAXCYS
BETHEL
BELFAST
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PLYMOUTH
MOULTONBORO
RUTLAND
WHITE RIVER JUNCT.
WINDSOR
FRANKLIN
LACONIA
ALTON
CAVENDISH
CLAREMONT
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WORCESTER
REVERE
HOLYOKE
WARE
CAMBRIDGE
MILLBURY
BOSTON
CHICOPEE
WESTFIELD
SPRINGFIELD
PALMER
MEDWAY
EDGAR STA.
AGAWAM
UXBRIDGE
WALPOLE
BROCKTON
MANSFIELD
FALLS VILLAGE
WINDSOR LOCKS
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HARTFORD
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BULLS BRIDGE
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NEW BRITAIN
SCOTLAND
MONTAUP
FALL RIVER
NEW BEDFORD
WATERBURY
MIDDLETOWN
WARREN
NORWICH
TAFTVILLE
MERIDEN
STEVENSON
NEWPORT
DANBURY
MONTVILLE
DERBY
DEVON
NEW HAVEN
NEW LONDON
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NORWALK
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Figure 9

INTERCONNECTIONS OF CENTRAL POWER STATIONS

The growth of power equipment and capacity is only one indicator of the availability of power to meet the requirements of industry. The interconnections which tie up individual units into large systems are important in providing a reserve supply of energy to meet maximum demands. These interconnections equalize the distribution of current to meet the load required at different places and different times. Since peak loads do not regularly appear simultaneously in all parts of an area, the interconnection of power units by means of a unified system permits the distribution of peak loads so as to relieve the individual plant of the necessity of installing equipment for meeting its maximum requirements single handed. The economies resulting from such interconnections in turn admit of lower rates to power users.

The fact that New England is a natural power unit argues for the unifying of its power resources in the way that will permit their most efficient and economical utilization. In the last few years there has been a growing tendency for neighboring power companies to consolidate, or to connect their lines and sell electrical power to each other as needed. As most of these power companies have their peak loads at different times, such a system is of great value in distributing and equalizing their power requirements. The central stations of New England are actively interested in the economic development of their territories and encourage the introduction of new industries and the expansion of established industries by providing information that will aid in industrial development.

Some of these interconnecting lines have been in existence for many years, but the development has been much more rapid during the last three or four years than during the dozen years preceding. With the exception of Maine, the present density of these interconnecting lines in the New England States is at least equal to that in the leading States of New York, New Jersey, and Pennsylvania. It is considerably more dense than that of any other part of the United States, with the possible exception of the region centering in Chicago. The extent of the present interconnections in the various power areas of New England is shown graphically in Figure 9. This map indicates, in addition to the location of the different types of power stations, the location of undeveloped hydroelectric sites in northern New England.

WATER-POWER DEVELOPMENT

The rugged topography of New England, giving rise to falls and rapids in the numerous rivers and streams flowing from the mountainous interior in comparatively short routes to the sea, provides a great many locations with sufficient fall for generating water power. Coupled with this is the presence of many lakes and ponds, which form natural reservoirs and thus maintain the regularity of supply by restraining the water that falls on these areas from draining off rapidly.

Water power depends not only upon the elevation or drop in the stream but also upon the extent of the drainage area and upon the reserve supply that is available from natural or artificial storage reservoirs.

The extent of all water-power resources of the New England States and the degree to which they have been developed is shown in the following table.

Total Potential Water Power of New England States

State	Capacity available 90 per cent of the time		Capacity available 50 per cent of the time		Developed capacity in 1927	
	Horsepower	Per cent of New England	Horsepower	Per cent of New England	Horsepower	Per cent of New England
Maine	536, 000	53. 7	1, 074, 000	54. 3	537, 161	34. 5
New Hampshire	186, 000	18. 7	350, 000	17. 7	278, 002	17. 9
Massachusetts	106, 000	10. 6	235, 000	11. 9	362, 123	23. 2
Vermont	80, 000	8. 0	169, 000	8. 5	200, 157	12. 9
Connecticut	65, 000	6. 5	110, 000	5. 6	148, 423	9. 6
Rhode Island	25, 000	2. 5	40, 000	2. 0	30, 188	1. 9
Total	998, 000	100. 0	1, 978, 000	100. 0	1, 556, 054	100. 0
United States	34, 818, 000	----------	55, 030, 000	----------	12, 296, 000	----------
New England as per cent of United States	2. 87	----------	3. 60	----------	13. 1	----------

Source: U. S. Geological Survey.

The first column of this table shows what might be termed the commercially available water power capable of providing practically continuous energy. This is naturally much less than the energy that is available only 50 per cent of the time. The latter may be termed the maximum power capacity.

The estimated capacity of New England rivers and streams available 90 per cent of the time amounts to a little less than 1,000,000 horsepower and represents about 2.9 per cent of the total for the whole United States in this class. The capacity available 50 per cent of the time is naturally much greater, amounting to approximately 2,000,000 horsepower. This represents a somewhat greater proportion (3.6 per cent) of the national total for this intermittent power.

About four-fifths of all the potential water power of New England is in the three northern States, and only one-fifth is in the three industrial States of the South. More than one-half of the total is in Maine; upward of one-fourth is in New Hampshire and Vermont; a little more than one-tenth is within the boundaries of Massachusetts; and Connecticut and Rhode Island together contain less than one-tenth of the New England total.

GROWTH OF WATER-POWER DEVELOPMENT

The water-power resources of New England were developed earlier and more fully than those of other sections of the country. It will be many years before all the water-power sites in the United States are developed to a greater extent than the sites that have been utilized in the New England States.

Figures of water-power development as indicated by the capacity of all water wheels installed in plants of 100 horsepower and above show a fairly steady and continuous increase in this region; the relative position of New England in the water-power development of the country as a whole, however, shows a steady and continuous reduction—from 24.6 per cent in 1909 to 12.2 per cent in 1928, as is shown in the following table.

GROWTH IN NEW ENGLAND WATER-POWER DEVELOPMENT AS COMPARED WITH THE UNITED STATES, 1909–1928

[In thousands of horsepower]

Year	Capacity of water wheels installed in plants of 100 horsepower or more			Year	Capacity of water wheels installed in plants of 100 horsepower or more		
	New England	United States	New England as per cent of United States total		New England	United States	New England as per cent of United States total
1928	1,654	13,572	12.2	1918	1,190	7,110	16.7
1927	1,536	12,296	12.7	1917	1,160	6,800	17.1
1926	1,535	11,721	13.1	1916	1,140	6,470	17.6
1925	1,399	10,038	13.3	1915	1,090	6,140	17.8
1924	1,387	9,087	14.0	1914	1,060	5,790	18.3
1923	1,390	9,090	15.3	1913	1,050	5,480	19.2
1922	1,330	8,270	16.1	1912	1,020	4,770	21.4
1921	1,310	8,050	16.3	1911	1,000	4,530	22.1
1920	1,300	7,800	16.7	1910	970	4,220	23.0
1919	1,250	7,590	16.5	1909	950	3,870	24.6

EXTENT OF PRESENT DEVELOPMENT

The extent of present water-power development in New England, and its magnitude in the individual States, as indicated by horsepower capacity, is shown in the first column of the following table. It is observed that Maine accounts for slightly more than one-third of the New England total; Massachusetts has a little less than one-fourth, and New Hampshire a little less than one-fifth; Vermont contributes more than one-eighth, and Connecticut and Rhode Island together a little less than one-eighth.

DEVELOPED WATER POWER IN NEW ENGLAND STATES IN PLANTS OF 100 HORSEPOWER OR MORE, 1926–1928

State and year	Total capacity		Public utility and municipal		Manufacturing and miscellaneous	
	Horsepower	Per cent of New England total	Horsepower	Per cent of New England total	Horsepower	Per cent of New England total
Maine:						
1928	538, 761	32. 6	239, 801	27. 2	298, 260	38. 6
1927	537, 161	34. 5	234, 230	30. 0	302, 931	39. 3
1926	525, 509	34. 2	222, 570	28. 6	302, 939	40. 1
Massachusetts:						
1928	362, 123	21. 9	159, 211	18. 1	202, 912	26. 2
1927	362, 123	23. 3	159, 211	20. 5	202, 912	26. 4
1926	353, 939	23. 0	171, 977	22. 1	181, 962	24. 1
New Hampshire:						
1928	278, 002	16. 8	143, 711	16. 3	134, 291	17. 4
1927	278, 002	17. 9	143, 711	18. 5	134, 291	17. 4
1926	277, 252	18. 1	143, 711	18. 4	133, 541	17. 7
Vermont:						
1928	260, 157	15. 7	216, 501	24. 6	43, 656	5. 6
1927	200, 157	12. 9	156, 501	20. 1	43, 656	5. 7
1926	200, 157	13. 0	156, 501	20. 1	43, 656	5. 8
Connecticut:						
1928	184, 423	11. 2	117, 405	13. 3	67, 018	8. 7
1927	148, 423	9. 5	81, 405	10. 5	67, 018	8. 7
1926	184, 423	9. 7	81, 405	10. 4	67, 018	8. 8
Rhode Island:						
1928	30, 188	1. 8	3, 285	. 5	26, 903	3. 5
1927	30, 188	1. 9	3, 285	. 4	26, 903	3. 5
1926	30, 188	2. 0	3, 285	. 4	26, 903	3. 5
Total:						
1928	1, 653, 654	100. 0	879, 914	100. 0	773, 740	100. 0
1927	1, 556, 062	100. 0	778, 343	100. 0	771, 711	100. 0
1926	1, 535, 468	100. 0	779, 449	100. 0	756, 019	100. 0
United States total:						
1928	13, 571, 530	----------	11, 886, 336	----------	1, 658, 194	----------
1927	12, 296, 000	----------	10, 538, 381	----------	1, 757, 619	----------
1926	11, 720, 983	----------	9, 961, 202	----------	1, 759, 781	----------
New England as per cent of United States:						
1928	----------	12. 2	----------	7. 4	----------	45. 9
1927	----------	12. 7	----------	7. 4	----------	43. 9
1926	----------	13. 1	----------	7. 8	----------	42. 4

Comparison of the ownership of this developed water power is instructive. For New England as a whole the ownership is almost equally divided between the public utility and municipal plants on one hand and the private manufacturing establishments on the other. Public agencies are slightly in the lead for the region as a unit; they stand out particularly in Vermont and Connecticut. The private manufacturing establishments have a pronounced lead, however, in Massachusetts, Maine, and Rhode Island. Private development of water power bears a much higher proportion of the total in New England as a whole than it does nationally; and public agencies hold a less prominent place in New England than they do for the country at large.

UNDEVELOPED WATER-POWER RESOURCES IN NEW ENGLAND

The report of the Power Investigating Committee of the Associated Industries of Massachusetts showed that in 1922 the undeveloped capacity of water-power sites which were capable of practical development so as to make power available 60 per cent of the time on a full-load factor, in all New England, comprised about 865,000 horsepower. This included only sites with capacities exceeding 1,000 horsepower, and did not allow for possible increases from addition of storage developments with suitable pondage. It was estimated that a total installed capacity of about 1,720,000 horsepower would be required to make full use of this capacity if developed by adequate reservoirs. The estimate of the United States Geological Survey for power available 50 per cent of the time instead of 60 per cent is naturally somewhat larger.

LOCATION OF UNDEVELOPED RESOURCES

The power resources of industrial southern New England are, on the whole, already utilized intensively. There remain in this section few water-power sites that are capable of extensive new development. Additional water power of special interest to the industries of southern New England is that resulting from the redevelopment of existing sites or from the construction of storage reservoirs. It is significant that practically all water-power development of any importance in southern New England in the last 20 years has been of this nature.

Upward of 80 per cent of the undeveloped water power as computed in the above-mentioned report was located in four river basins of northern New England—the Penobscot, the Kennebec, the Androscoggin, and the upper Connecticut River. The following table gives the computed undeveloped horsepower capacity of the various river basins of New England, and the corresponding kilowatt-hours which they would be capable of adding per year. On these same rivers there are many available power sites in units of less than 1,000 horsepower, not included in this table, whose output would be absorbed for local uses. About 75 per cent of the total undeveloped power was in the State of Maine. A substantial amount of development has taken place in some of these river basins since these estimates were prepared.

Undeveloped Water Power in New England River Basins in 1922

River basin	Horsepower capacity available 60 per cent of the time	Corresponding millions of kilowatt-hours per year
Penobscot	236, 605	1, 325
Kennebec	222, 670	1, 295
Connecticut	141, 250	735
Androscoggin	115, 730	668
St. John	38, 830	200
Saco	29, 440	158
Merrimack	27, 290	170
St. Croix	19, 455	110
Housatonic	18, 990	99
Lake Champlain	9, 100	49
Quinegaug	3, 240	17
Machias	2, 390	12
Total	864, 990	4, 830

Source: Power Investigating Committee of Associated Industries of Massachusetts.

WATER-POWER SOURCES ADJACENT TO NEW ENGLAND

In addition to the undeveloped water-power sources within the New England States the region is situated not far from other abundant potential sources that merit consideration.

Situated at the eastern extremity of Maine, on the international boundary of New Brunswick, is the Passamaquoddy Bay power project. This contemplates the development of between 500,000 and 1,000,000 horsepower, at a cost of installation from $75,000,000 to $100,000,000. The plan of this project is to develop power by the creation of reservoirs and pools for impounding the high tides that rush into this area twice daily from the Bay of Fundy. The construction of massive dams and locks will harness the flow of water arising from the difference in water levels by directing its force against turbines installed in power stations at this site.

On the St. Lawrence River, located between Ogdensburg, N. Y., and Montreal, are three important water-power areas, all within a radius of 250 miles from central Massachusetts. It is estimated that these could develop about 5,000,000 horsepower, which would be capable of delivering from 20,000,000,000 to 25,000,000,000 kilowatt-hours annually. The development of these sites will depend upon international agreements and upon negotiations for the projected canalization of the St. Lawrence River for deep-sea navigation.

Somewhat more distant than this area is the power field of the Ottawa, St. Maurice, and Saguenay and St. Francis Rivers, in the Province of Quebec, which are estimated to be capable of a continuous output of about 2,500,000 horsepower. About 700,000 horsepower is now developed and construction is under way to make available about 600,000 more. A considerable portion of this power is used in the pulp and paper industry in Quebec. All this field is within 450 miles of the center of power demand in eastern Massachusetts, and about one-fourth of it is within a radius of 300 miles. The engineers who made the power report offered the opinion that importation of Canadian power might become feasible, even in spite of expected efficiencies and decreased labor costs of future steam stations at tidewater sites in New England.

NEW ENGLAND FUEL SUPPLY

NOTE.—The section on fuel was prepared with the cooperation of the Bureau of Mines.

The fuel question is one of major importance in New England, both to its industries and to its householders. The region must depend entirely upon outside sources for fuel, with the exception of wood, for no mineral fuels—neither coal, natural gas, nor oil—are produced commercially anywhere in New England. (See p. 58.) With its large consumption of fuel, both for industries and for household use, the transportation of necessary supplies becomes a factor of very great importance. Shipments of coal and oil into New England comprise a major portion of the total volume of freight traffic into this section. Fuel is thus the principal item in creating the great excess of inward-moving freight over outward shipments. It is therefore the principal factor in the problem of heavy one-way movement, with the resulting burden upon transportation equipment.

New England's chief dependence for fuel is upon anthracite and bituminous coal from Pennsylvania and West Virginia, but large volumes of petroleum and petroleum products, brought in by tanker from California, the Gulf Coast, and foreign ports, are consumed. Coke, briquets, and other forms of solid fuel are used to a limited extent, in addition to manufactured gas. In recent years the consumption of petroleum as fuel has been of increasing importance, largely in consequence of the shortage and resultant high prices of coal. In years of special shortage of coal considerable quantities of anthracite and bituminous have also been imported, chiefly from the British Isles.

COAL CONSUMPTION

New England consumes approximately 30,000,000 tons of anthracite and bituminous coal yearly. The 6-year average from 1921 to 1926, inclusive, was 30,077,000 tons, varying from a minimum of 25,278,000 tons in 1922 to nearly 36,000,000 tons the following year. The total receipts of domestic coal in 1928, according to the Massachusetts Special Commission on the Necessaries of Life, were 29,028,000 net tons; in 1926 they were 31,679,000 tons.

Approximately two-thirds of the total receipts is bituminous coal, and one-third is anthracite. In 1928 the reported receipts of bituminous were 19,652,000 tons and of anthracite 9,376,000 tons. The figures for 1926 were 21,067,000 tons and 10,612,000 tons, respectively. The 6-year average from 1921 through 1926 for bituminous was 20,156,000 tons, and that for anthracite was 9,921,000 tons. The greater proportion of the anthracite, probably 90 per cent of the total, is for household consumption. The greater proportion of the bituminous coal, however, is consumed by New England manufacturing plants and by public-utility companies for the production of power consumed in the industries.

A test made by the United States Fuel Administration, covering a 6-month period in 1918–19, showed that of the total rail shipments of bituminous coal in that period approximately 60 per cent were consigned directly to the industries, 19 per cent went to retail coal dealers, 16 per cent to public-utility companies, and 5 per cent to public institutions. This covered only rail shipments, and it is probable that a greater proportion of the water shipments went to manufacturers, since manufacturing activities predominate in the tidewater service areas.

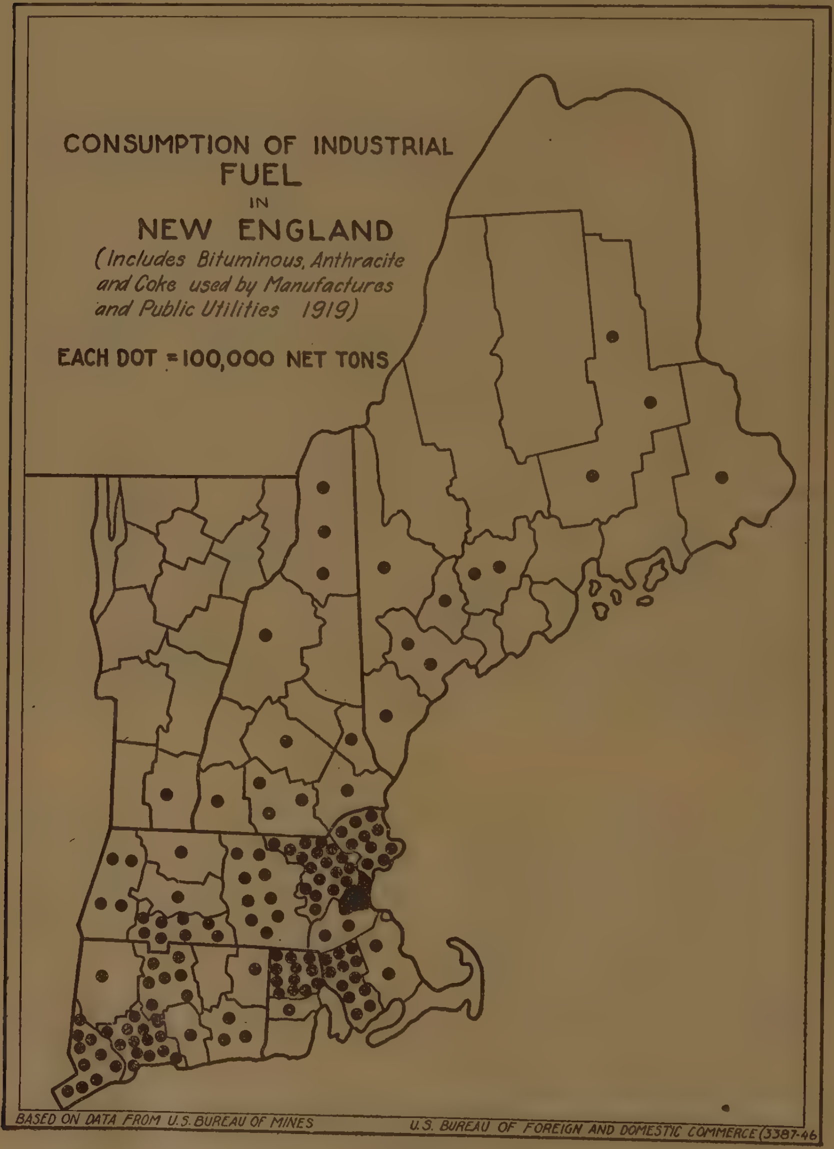

CONSUMPTION OF INDUSTRIAL FUEL IN NEW ENGLAND
(Includes Bituminous, Anthracite and Coke used by Manufactures and Public Utilities 1919)
EACH DOT = 100,000 NET TONS
BASED ON DATA FROM U.S. BUREAU OF MINES
U.S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE (3387-46

Figure 10

The total coal consumed by all New England manufacturing establishments in 1923, as reported in the census for that year (the latest for which complete data are available by States), was 11,402,000 tons, distributed among the six States as follows:

COAL CONSUMED BY NEW ENGLAND MANUFACTURING ESTABLISHMENTS IN 1923

[In thousands of tons]

State	Bituminous	Anthracite	Total
Massachusetts	5, 307	500	5, 807
Connecticut	2, 279	198	2, 477
Maine	1, 141	61	1, 202
Rhode Island	827	32	859
New Hampshire	505	250	756
Vermont	269	33	301
Total	10, 328	1, 074	11, 402

A ton of coal was consumed, on the average, for every $561 in value of manufactured products. The value of products represented by 1 ton of coal in 1923 varied, in different lines, from $48 in gas manufacture and $155 in paper manufacturing to $3,159 in the boot and shoe industry. In the metal industries the value of products per ton of coal averaged $611. These figures do not take account of coal consumed in generating the electric current purchased by manufacturers from public-utility plants.

The relative coal consumption in the individual counties of New England is indicated by dots on the map (fig. 10), which shows the tonnage consumed by manufacturers and public utilities in 1919. Although this tonnage is for a period of postwar activity, it represents fairly accurately the relative importance of different portions of New England as consumers of bituminous coal. The counties of greatest consumption are naturally those having the greatest concentration of large coal-consuming industries. A large proportion of this consumption is seen to lie in areas near tidewater.

The annual receipts in New England of anthracite and bituminous coal from 1916 to 1928, as compiled by the Massachusetts Special Commission on the Necessaries of Life, are shown in the following table.

NEW ENGLAND RECEIPTS OF ANTHRACITE AND BITUMINOUS COAL, 1916–1928

Year	Thousands of tons			Year	Thousands of tons		
	Anthracite	Bituminous	Total		Anthracite	Bituminous	Total
1916	10, 715	24, 122	34, 837	1923	12, 184	23, 684	35, 868
1917	11, 680	23, 504	35, 184	1924	10, 611	18, 877	29, 488
1918	13, 621	27, 171	40, 792	1925	8, 280	21, 313	29, 593
1919	10, 578	18, 182	28, 760	1926	10, 612	21, 071	31, 679
1920	11, 255	22, 434	33, 689	1927	9, 146	22, 426	31, 572
1921	11, 374	17, 188	28, 562	1928	9, 376	19, 652	29, 028
1922	6, 471	18, 807	25, 278				

The total receipts show considerable fluctuation from year to year, largely because of strikes and coal shortages in the producing regions. Accumulation of coal stocks within New England in anticipation of strikes has prevented any great inconvenience to manufacturers. New England can conveniently store upward of 4,000,000 tons of coal. This accounts, in large measure, for the fluctuations in annual receipts. While no great change is shown in the general trend of total shipments, there has been a pronounced falling off in anthracite in recent years. In 1922 the receipts of anthracite were only a little more than half those of 1921. In 1925 receipts of anthracite were less than in either 1924 or 1926 by more than 2,000,000 tons. In bituminous there was a notable falling off in 1921, in 1922, and again in 1924.

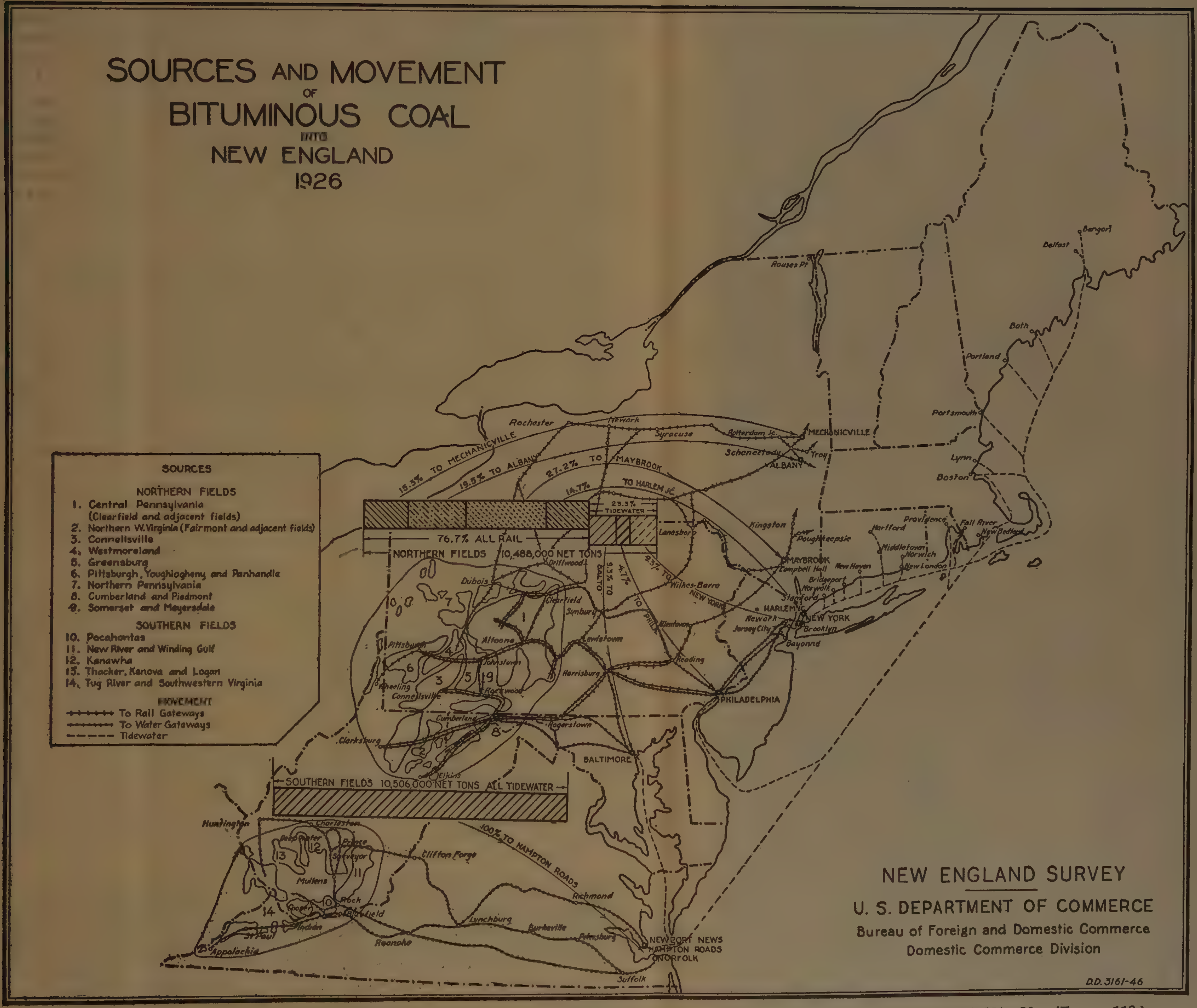
BITUMINOUS COAL

SOURCES

New England draws its supply of bituminous coal from two main producing fields, designated for convenience as the northern area and the southern area. There has been a pronounced change to the southern area in recent years. The northern area comprises the fields of Pennsylvania, northern West Virginia, and western Maryland, while the southern area includes the mines of southern West Virginia and adjacent districts in the western part of Virginia and in eastern Kentucky. These two producing sections were almost equally divided in the tonnage of coal shipped to New England in 1926, the southern area exceeding the northern by the slight amount of 18,000 tons in a total of nearly 21,000,000 tons. The major portion of the coal shipped from the northern area to New England moves by all-rail routes, while practically all of that from the southern fields moves by a combination of rail and tidewater routes.

The most important district in the northern area is that comprising the Clearfield and adjacent mines of central Pennsylvania, which contributed slightly over one-third of all New England's bituminous supply, and over two-thirds of that from the northern fields. More than four-fifths of the coal moving to New England by all-rail routes was from the central Pennsylvania region. Other districts in the northern area that shipped considerable quantities of coal, all rail, to New England in 1926 were the Greensburg, Westmoreland, and Connellsville districts, which shipped over 750,000 tons, and the Pittsburgh, Panhandle, and Westmoreland districts, which shipped about the same amount. A small quantity of the coal from these northern fields moved by rail to the ports of Philadelphia and New York, and thence by tidewater to New England. Northern West Virginia and western Maryland, which contributed something over 5 per cent of the entire bituminous movement in 1926, send their coal chiefly by rail to the port of Baltimore, and thence by tidewater to New England.

Coal shipped to New England from the southern area comes chiefly from the Pocahontas, New River, and Kanawha fields of southern West Virginia. Their distances from New England are


SOURCES AND MOVEMENT OF BITUMINOUS COAL INTO NEW ENGLAND 1926
SOURCES
NORTHERN FIELDS
1. Central Pennsylvania (Clearfield and adjacent fields)
2. Northern W. Virginia (Fairmont and adjacent fields)
3. Connellsville
4. Westmoreland
5. Greensburg
6. Pittsburgh, Youghiogheny and Panhandle
7. Northern Pennsylvania
8. Cumberland and Piedmont
9. Somerset and Meyersdale
SOUTHERN FIELDS
10. Pocahontas
11. New River and Winding Gulf
12. Kanawha
13. Thacker, Kenova and Logan
14. Tug River and Southwestern Virginia
MOVEMENT
To Rail Gateways
To Water Gateways
Tidewater
15.3% TO MECHANICVILLE
19.5% TO ALBANY
27.2% TO MAYBROOK
14.7% TO HARLEM JC.
23.3% TIDEWATER
76.7% ALL RAIL
NORTHERN FIELDS 10,488,000 NET TONS
9.3% TO BALTO
4.7% TO PHILA
9.3% TO NEW YORK
SOUTHERN FIELDS 10,506,000 NET TONS ALL TIDEWATER
100% TO HAMPTON ROADS
Rochester
Newark
Syracuse
Rotterdam Jc.
MECHANICVILLE
Schenectady
Troy
ALBANY
Rouses Pt
Bangor
Belfast
Bath
Portland
Portsmouth
Lynn
Boston
Kingston
Poughkeepsie
Lanesboro
MAYBROOK
Campbell Hall
Hartford
Providence
Fall River
New Bedford
Middletown
Norwich
New London
New Haven
Bridgeport
Norwalk
Stamford
HARLEM JC.
NEW YORK
Newark
Jersey City
Brooklyn
Bayonne
Wilkes-Barre
Allentown
Reading
PHILADELPHIA
Driftwood
Dubois
Clearfield
Sunbury
Altoona
Lewistown
Pittsburgh
Johnstown
Harrisburg
Wheeling
Connellsville
Rockwood
Cumberland
Hagerstown
Clarksburg
Elkins
BALTIMORE
Huntington
Charleston
Deepwater
Prince
Sewell
Surveyor
Mullens
Rock
Cooper
Bluefield
Indian
St Paul
Appalachia
Clifton Forge
Roanoke
Lynchburg
Burkeville
Richmond
Petersburg
NEWPORT NEWS
HAMPTON ROADS
NORFOLK
Suffolk
1
2
3
4
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12
13
14
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division
D.D. 3161-46

Figure 11

too great to admit of all-rail shipments in competition with the northern fields; hence practically all the shipments to New England from this southern section are by rail to tidewater at Hampton Roads and thence by vessel to New England ports. The movement from the southern fields, comprising more than half the total bituminous shipments to New England, makes up more than four-fifths of the total movement by tidewater. The remainder, amounting to less than one-fifth of all shipments by tidewater, moves from the northern field through the ports of Baltimore, New York, and Philadelphia. The southern movement by tidewater in 1926 amounted to upward of 10,500,000 tons, moving through Hampton Roads, while that moving through the ports from the northern field was less than 2,500,000 tons.

The following table shows the total bituminous movement to New England from 1916 to 1928 and the amount by tidewater and by all-rail routes, as reported to the United States Bureau of Mines, together with averages for the eight years from 1921 to 1928 and for the five years from 1916 to 1920. Since 1921 the tidewater movement has averaged better than 62 per cent of the total, while for the five years previous it was 53.5 per cent of the total movement. In 1920 it was only 46 per cent, while in 1927 it was nearly 68 per cent, and was upward of 60 per cent in every year but one since 1921.

TOTAL MOVEMENT OF BITUMINOUS COAL TO NEW ENGLAND BY TIDEWATER AND BY ALL-RAIL ROUTES, 1916–1928

[In thousands of short tons]

Year	Total	By tidewater route		By all-rail routes	
		Quantity	Per cent of total	Quantity	Per cent of total
1928	19, 651	13, 176	67. 1	6, 473	32. 9
1927	22, 426	15, 194	67. 8	7, 232	32. 2
1926	20, 994	12, 949	61. 7	8, 045	38. 3
1925	21, 220	13, 463	63. 5	7, 756	36. 5
1924	18, 473	11, 488	62. 2	6, 985	37. 8
1923	23, 008	13, 374	58. 1	9, 634	41. 9
1922	16, 704	10, 892	65. 2	5, 812	34. 8
1921	17, 233	8, 859	51. 4	8, 374	48. 6
8-year average, 1921–1928	19, 964	12, 435	62. 2	7, 539	37. 8
1920	22, 663	10, 456	46. 1	12, 207	53. 9
1919	18, 040	8, 385	46. 5	9, 655	53. 5
1918	27, 171	16, 058	59. 1	11, 114	40. 9
1917	23, 504	12, 692	54. 0	10, 811	46. 0
1916	24, 122	14, 193	58. 8	9, 929	41. 2
5-year average, 1916–1920	23, 100	12, 357	58. 5	10, 743	46. 5

MOVEMENT FROM NORTHERN FIELD

Upward of three-quarters of the total bituminous movement into New England from the northern field in 1926 moved by all-rail routes, passing through four principal rail gateways at the Hudson River crossings. Over 35 per cent of the total rail movement passed through Maybrook, N. Y., destined mainly for points on the New Haven

Railroad system. About 19 per cent moved through the junction point at Harlem River. Nearly 55 per cent of the total all-rail movement thus passed through these gateways into southern New England, 25 per cent passed through Albany, N. Y., and about 20 per cent through Mechanicville and Troy, destined for New England points served by the Boston & Albany Railroad and the Boston & Maine. This includes a small movement through Rouses Point. The gateways at the exit of the Mohawk Valley thus account for 45 per cent of the total all-rail movement of bituminous coal into New England.

The importance of these rail routes and of the tidewater routes in shipments from the northern field into New England is shown for 1926 in the following table.

ROUTES OF BITUMINOUS COAL FROM NORTHERN FIELD INTO NEW ENGLAND, 1926

Route	Tons	Per cent of all-rail or tidewater	Per cent of total northern	Per cent of total northern and southern
All-rail:				
Maybrook	2, 853, 485	35. 5	27. 2	13. 6
Albany	2, 040, 961	25. 4	19. 5	9. 7
Mechanicville and Troy	1, 604, 130	19. 9	15. 3	7. 6
Harlem	1, 546, 207	19. 2	14. 7	7. 4
Total all-rail	8, 044, 783	100. 0	76. 7	38. 3
Tidewater:				
Baltimore	977, 472	7. 5	9. 3	4. 7
New York	972, 945	7. 5	9. 3	4. 6
Philadelphia	492, 667	3. 8	4. 7	2. 3
Total tidewater	2, 443, 084	18. 8	23. 3	11. 6
Total rail and tidewater	10, 487, 867	100. 0	100. 0	49. 9

Source: Massachusetts Special Commission on Necessaries of Life for figures on "All-rail" and Bureau of Mines for "Tidewater."

The general location of the coal fields which supply New England and the routes taken by coal shipments by rail and water, together with the proportions of the total movements that go by each of the indicated routes, are shown in Figure 11. A general summary of all the bituminous coal shipments to New England, showing the volume and the percentage from the different fields, classified by rail and by tidewater, is given in the following table.

SUMMARY OF ALL BITUMINOUS SHIPMENTS TO NEW ENGLAND IN 1926, BY SOURCES AND ROUTES

Field and route	Total rail and tidewater shipments			Total rail shipments[1]			Total tidewater shipments		
	Tons	Per cent of all shipments	Per cent of shipments from field	Tons	Per cent of all rail shipments	Per cent of total rail and water	Tons	Per cent of all tidewater	Per cent of all shipments
NORTHERN FIELDS									
Central Pennsylvania (Clearfield and adjacent fields)	7, 170, 050	34. 1	68. 4	6, 516, 274	81. 0	31. 0	653, 776	5. 0	3. 1
Northern West Virginia	1, 085, 447	5. 2	10. 3	94, 929	1. 2	. 5	990, 518	7. 7	4. 7
Greensburg, Westmoreland, and Connellsville	765, 290	3. 6	7. 3	620, 253	7. 7	2. 9	145, 037	1. 1	. 7
Pittsburgh, Youghiogheny, and Panhandle	754, 883	3. 6	7. 2	405, 457	5. 0	1. 9	349, 426	2. 7	1. 6
Northern Pennsylvania	303, 288	1. 4	2. 9	303, 288	3. 8	1. 5			
Cumberland, Piedmont, Myersdale, and Somerset	286, 733	1. 4	2. 7	104, 582	1. 3	. 5	182, 151	1. 4	. 9
Other fields	122, 176	. 6	1. 2				122, 176	. 9	. 6
Total northern	10, 487. 867	49. 9	100. 0	8, 044, 783	100. 0	38. 3	2, 443, 084	18. 9	11. 6
SOUTHERN FIELDS									
Pocahontas and New River	8, 336, 819	39. 7	79. 4				8, 336, 819	64. 4	39. 7
Kanawha	1, 542, 065	7. 3	14. 0				1, 542, 065	11. 9	7. 3
Other fields	626, 971	2. 9	5. 9				626, 971	4. 8	2. 9
Total southern	10, 505, 855	50. 0	100. 0				10, 505, 855	81. 1	50. 1
Grand total	20, 993, 722	100. 0		8, 044, 783			12, 948, 939	100. 0	

[1] In 1926, on account of the anthracite miners' strike, a considerable tonnage moved into New England all-rail from the southern fields; since then they have supplied no all-rail shipments of coal.

AREAS SERVED BY DIFFERENT FIELDS

Competition between the tidewater coal from the southern field on the one hand, and the coal from the northern field moving either by all-rail routes or through the ports of New York, Philadelphia, and Baltimore, and thence by water, is determined by the relative costs of transportation and by the quality of coal desired by consumers. Transportation from the southern field involves movement by rail from the mines to Hampton Roads, and thence by barge or steamer to New England ports. The tidewater movement from the northern field involves, similarly, rail transportation from the mines to the ports of New York, Philadelphia, or Baltimore, and thence by barge to the port of destination.

Cost of transportation therefore includes railroad freight from the mine to the shipping port, the water rate to the port of arrival, cost of unloading barges, and freight charges from the port to the interior point of consumption. The distance to which tidewater coal can be shipped inland from the port of arrival in competition with all-rail movement varies with the relation between the through all-rail rate from the mine and the local rail rate inland from the port. Variation in the costs of coal at the mine resulting from labor costs, as well as the variation in cost of transportation from the respective northern and southern fields, prevents a definite fixing of limits to the territory served by each.

The requirements of consumers also are variable for the different kinds of fuel furnished by different fields. New England manufacturers prefer coal of low volatility for steam purposes as well as for domestic consumption, while the more highly volatile coal is generally used for gas manufacture and by the railroads. Coal that moves by tidewater is considerably broken up by the extra handling incident to loading and unloading in vessels, whereas coal shipped by all-rail routes is much less broken. While some consumers prefer the smokeless coal from West Virginia and others have a decided preference for Pennsylvania coal, the choice of many is governed only by the relative price and service offered. The higher grades of coal from the Pennsylvania field enter into keen competition with coal from the southern West Virginia field in the principal fuel-consuming sections of New England where one source does not have advantage in transportation cost over the other.

In general, the market for tidewater coal extends along the New England coast to include the port cities and reaches inward to points where the cost of transportation inward from the New England port offsets the advantage of the water route over the all-rail route. This usually extends from 15 to 40 miles from the port, although tidewater shipments are made into the interior as far as Worcester and Springfield.

The tidewater coal from the southern field enters into competition with the all-rail coal from the northern field, principally in the industrial regions extending along the coast eastward from New London, Conn., reaching back into the interior 25 to 40 miles. West of New London the consuming region bordering on Long Island Sound and along the Connecticut River obtains its coal chiefly by tidewater from the northern field, transported in shallow barges from the New York Harbor piers. East of New London the coast is served both by vessels from the southern field moving by way of Hampton Roads and by barges from the northern field moving by way of Baltimore and Philadelphia.

In recent years coal from the southern fields has penetrated farther into the interior. This is due not only to the high qualities of the coal from the southern mines but to the greater regularity and dependability of supply in consequence of labor difficulties in the northern mines. The southern operators have made special efforts to render service to their New England customers, and as a result shipments from the southern field have increased while those from the northern field, by rail and by tidewater, have declined.

The State of Connecticut gets practically all its coal supplies from the northern field, since the southern coal can not compete with that from Pennsylvania. Most of the State receives its coal by the all-rail route. New Haven is the only commercial port in Connecticut with facilities for deep-water steamers, and water-borne coal for all other Connecticut ports goes by barge, even to the larger ports of Hartford, Bridgeport, Norwalk, and New London. Very little bituminous coal is now shipped from New York harbor to points beyond Bridgeport and New Haven.

In Rhode Island most of the supplies come from the southern field, although some consumers, even close to tidewater, use all-rail coal from Pennsylvania. In some years large amounts of Welsh anthracite have been brought into Rhode Island for household uses.

The southern and eastern parts of Massachusetts get the major portion of their supply by tidewater from the southern field, and a considerable amount from the northern field by tidewater from Baltimore and Philadelphia. The interior and western parts of the State depend upon all-rail coal from the northern field.

In Vermont and in the interior of New Hampshire, coal from the northern field dominates the situation entirely, since the southern field can not compete there with the all-rail shipments. In Maine, however, coal from the southern field can be brought in at tidewater rates that are lower than those by all-rail routes from the northern field. The principal consumption is in the southern section of the State; only a negligible portion goes to eastern and northern Maine. The total coal consumption of the State does not exceed 2,000,000 tons a year, and one-third of this is high volatile coal for railroad and gas purposes, which comes from the northern field.

TRANSPORTATION RATES

Freight rates by all-rail routes to New England are based on those from the Clearfield district. This is the principal rail source for New England's bituminous supply. It is nearer to New England than any other portion of the northern region and has a lower rate than any other field. The Greensburg district, averaging 47 miles farther than Clearfield, adds 10 cents a ton to the Clearfield rate, while both the Westmoreland and the Pittsburgh district, still farther distant, take an additional 40 cents a ton over the Clearfield rate. The following table shows the rail distances from the Clearfield district of Pennsylvania to representative consuming points in New England, with the rates now in force.

Rail Distances and Rates from Clearfield District

Destination	Distance in miles	Rate per ton	Destination	Distance in miles	Rate per ton
Boston, Mass	563	$4.22	New Haven, Conn	424	$3.59
Springfield, Mass	487	4.07	New Britain, Conn	452	4.07
Lowell, Mass	581	4.83	Bellows Falls, Vt	646	4.60
Framingham, Mass	551	4.45	Manchester, N. H	617	4.95
Providence, R. I	536	4.20	Portland, Me	658	4.85

The northern carriers publish all-rail rates to all points in New England. These rates are much lower than any possible rates by all-rail routes from the southern district. This is shown in the following table by a comparison of the approximate all-rail distances to the New England gateways from the Clearfield district, in the northern region, and from the Pocahontas district, in the southern region.

RAIL DISTANCES TO NEW ENGLAND GATEWAYS

Gateway	From Clearfield district	From Pocahontas district
	Miles	*Miles*
Albany, N. Y.	381	746
Mechanicville, N. Y.	386	752
Maybrook, N. Y.	326	612
Portland, Me.	656	933
Greenville, N. J.	340	604

The carriers publish also transshipment rates from the northern field to tidewater at Philadelphia and Baltimore on coal moving to New England by water craft destined to points east of New London, as well as tidewater transshipment rates to New York Harbor intended to take care of New York Harbor deliveries and deliveries at Long Island Sound.

For coal moving from the southern field by way of Hampton Roads the southern carriers publish tidewater rates to deep-water piers in New England. The base rate from mines in the southern area to tidewater is $2.52 a gross ton; the steamer freight rate from Hampton Roads to New England ports in recent years has ranged from 75 cents to $1 a ton on large tonnage. Added to this is a charge of 35 to 60 cents a ton for discharging vessels into cars, and a weighing charge of 1 to 3 cents additional. The average distances of transportation to tidewater ports from the southern coal districts, in comparison with distances from the northern district to tidewater, are as follows.

	Miles
From southern fields base-rate area to Hampton Roads	416
From Clearfield to port of—	
New York	359
Philadelphia	305
Baltimore	249

MARKETING

The marketing of coal to industrial users in New England does not vary greatly from that in other sections of the country. The larger coal operators have their representatives in Boston and other important cities making contracts with the large manufacturers for direct shipment from mines to the manufacturers' plants, either by all-rail or by rail-and-water routes. The representatives of the southern operators confine their activities to regions near the coast, in which tidewater coal can meet the competition from the northern field.

Most of the coal from the southern field is transported to New England in large steamers or barges to ports which have modern facilities for discharging and considerable storage capacity. The principal deep-water ports served by the southern field are Providence, Fall River, New Bedford, Boston, Salem, Portsmouth, Portland, Bath, and Bangor. Some of the larger shippers from the southern field own or control their wharves and docks, and some of these docks are owned by wholesale or retail dealers. The smaller industrial consumers buy their coal from local wholesale dealers, who in turn purchase their supplies through the operators' agents.

The elements of cost entering into the price to the consumer on all-rail shipments are base cost at the mine, plus freight charges from the mine to the manufacturer. For tidewater shipments the factors are freight charges from mine to tidewater port, water rates to landing port, unloading charge, and rail freight from port to plant. The latter item is sometimes eliminated by consumers who truck direct from landing port to their plant, this being practiced in some instances as far as 30 miles from the port.

ANTHRACITE AND OTHER HOUSEHOLD FUELS

ANTHRACITE

New England householders depend chiefly upon anthracite coal for domestic fuel. More anthracite is consumed per capita than in any other section of the country. This fuel embodies the advantages of cleanliness, little smoke, and easy control. New England householders show pronounced preference for it, and use other coal only when anthracite can not be obtained. In consequence of the high price and restricted supply of anthracite in recent years, however, consumers have turned more and more to the higher grades of bituminous coal, to coke, briquets, and, to a lesser extent, to gas, fuel oils, and electricity.

Receipts of anthracite in New England exceeded 10,500,000 net tons in 1926, comprising approximately one-third of the total coal receipts for that year. The 6-year average from 1921 to 1926 was 9,921,000 net tons. For the five years prior to 1921 the annual average was 11,570,000 tons. It is thus apparent that New England consumers in recent years have had to resort in considerable measure to other fuels. The production of anthracite in the past 15 years has not kept pace with the increase in the anthracite-consuming population, and consequently it has been necessary to depend upon other sources of household fuel.

On the basis of actual heat value, at current price anthracite coal is a much less economical fuel than bituminous. The high cost, the high slate and ash content of anthracite, and its slow response to change in drafts, are counterbalanced in bituminous by considerably lower cost, competitive sources of supply, quick responses to changes of drafts, lower percentage of inert matter, and high heat content. The dirt and smoke of bituminous coal and the closer attention required in burning it prevent its more general household use. Also, the mechanical construction of boilers and heaters, with their small flues, sometimes gives difficulty in burning bituminous coal. Consequently much educational effort has been necessary to bring New England consumers to change from the use of anthracite. In the last few years, however, the domestic consumption of bituminous coal has been very materially increased. It was estimated that during the coal year 1926–27, about 600,000 tons of coal of low volatility were sold in Massachusetts for heating apartments and other dwellings. Most of this coal was run-of-mine sizes, but the smaller consumers made use of the prepared sizes. A large additional tonnage of bituminous was used for heating offices and other large buildings.

All the anthracite coal comes from the hard-coal regions of eastern Pennsylvania. Approximately two-thirds of the shipments are by all-rail routes, and about one-third is by tidewater by way of the ports of Philadelphia and New York. On account of strikes there has been pronounced fluctuation in the annual shipments to New England. In 1922 the total was less than 6,500,000 tons, and in 1925 it was somewhat above 8,250,000 tons.

COKE

Coke is becoming increasingly important as a domestic fuel in New England. Its consumption for household uses in Massachusetts alone during the coal year 1926–27 was estimated at 475,000 tons, as compared with 270,000 tons in 1924–25. Most of the coke sold in New England is supplied by local by-product and coal-gas plants. Its price per ton is ordinarily below that for anthracite, and by using coke in conjunction with the lower-priced steam sizes of anthracite a good fuel is obtained at lower cost. The frequent attention required by a coke fire, and the bulkiness which makes coke somewhat difficult to handle, are offset by advantages of cleanliness, quick response to change of drafts, and a fairly high heat value. The manufacture and marketing of coke suitable for domestic purposes has in recent years received increased attention.

FUEL OIL

Fuel oil has the advantage of convenience and high heat value besides requiring little attention and small space for storage. Its disadvantages are relatively high cost and the necessity of special storage equipment and of special burning mechanism. Various types of fuel-oil burners have been placed on the market in the last few years. The amount of fuel oil used for heating buildings in 1926 was 3,150,000 barrels, comprising about 15 per cent of the total quantity distributed in New England. Most of this, however, was used in commercial heating, and only a small fraction for the heating of homes. The total consumption for heating purposes in 1926 was more than double that of 1925, when the total for heating buildings was 1,311,000 barrels, exclusive of furnace oils and the lighter distillates.

In the past few years of coal shortage there was heavy consumption of crude oil as fuel by manufacturing plants and by public-utility power companies in various parts of New England. Since no crude oil is produced in New England, the entire supply for this section comes from other domestic and foreign sources, and is brought in by tankers from California, the Gulf coast, or foreign ports. From the crude oil are manufactured the usual proportions of gasoline, kerosene, lubricating oil, gas oil, and fuel oil.

The total distribution of fuel and gas oils in the six New England States in 1925, as compiled by the United States Bureau of Mines, was 21,648,000 barrels of 42 gallons each. Of this amount about 60 per cent, comprising 13,604,000 barrels, was brought in during that year by tanker from other refining districts; the remaining 40 per cent, amounting to 8,042,000 barrels, was produced in New England refineries. The principal refineries are in metropolitan Boston, Providence, and Fall River.

The consumption of fuel oil in New England was reported to have increased from 101,500,000 gallons in 1918, which was equivalent to 615,000 net tons of coal, to 674,271,000 gallons in 1922, equivalent to 4,086,000 net tons of coal. No figures are available as to the amount which was used for heating alone.

GAS AND ELECTRICITY

Improvement in the methods of producing and using gas and electricity has brought about a great increase in their consumption for fuel. Total sales of gas in Massachusetts increased from about 16,000.000,000 cubic feet in 1923 to about 25,000,000,000 cubic feet in 1925. In the same period the consumption of electricity increased from 338,000,000 to about 2,500,000,000 kilowatt-hours. It was estimated that in 1926, 1,000 homes in Massachusetts were being heated by gas fuel. Since gas for illuminating purposes has been largely superseded by electricity, the gas companies are turning to the domestic and industrial fields for a market.

WOOD

Wood is commonly used for heating and cooking purposes in the wooded rural sections of New England, where it is produced locally. Most of the farm homes of northern New England use wood for household fuel. In the urban communities it is used only as kindling or as a supplementary fuel in fireplaces.

IMPORTATIONS OF FUEL

New England has imported from other countries in some years considerable quantities of coal—both anthracite and bituminous—and coke. The principal volume of imports has consisted of anthracite, largely from Wales. This amounted in 1926 to 386,000 tons, valued at $3,250,000. Imports of coke in 1926 were about 85,000 tons, valued at upward of $500,000. Imports of bituminous coal have been slight since 1923. During that year and the preceding year nearly 3,000,000 tons were imported into New England, most of it coming in free of duty. Since 1923 the highest imports of bituminous in any one year were 62,000 tons in 1926. Recently there has been a considerable importation of briquets, mainly from Germany, the value in 1926 approaching $500,000.

NEAR-BY SOURCES OF FUEL

In eastern Nova Scotia there are abundant supplies of bituminous coal accessible to tidewater and within easy shipping distance from New England ports. The relatively high cost of mining this coal under present conditions, in comparison with that in the United States fields, and its lower quality in comparison with that of Pennsylvania or West Virginia, have prevented the recent importation of fuel from this near-by source to any important extent.

In southeastern Massachusetts and Rhode Island there is an area of approximately 500 square miles known as the Narragansett Coal Basin, which is underlain with thin veins of a graphitic form of anthracite coal. The area is approximately equal to that of the anthracite coal beds of Pennsylvania, but the veins are of varying thickness and they occur at widely variable depths, cropping out to the surface in a few places. On account of the high ash content of this coal and the expense entailed in mining the narrow and irregular veins in which it occurs, this Narragansett coal has not yet proved to be of commercial importance, although it has been mined and used locally at a few places.

The great advance in the cost of coal in the last few decades, in consequence of high transportation costs and increased mining expenses in the present fields of supply, has directed attention recently to the possibilities of this Narrangansett Coal Basin. Some authorities believe this may become a commercially important source of fuel for New England, so that the large annual payments to other sections of the country may be cut down. Proposals have been made to use these deposits industrially by subjecting the coal to special treatment at the mines and using it there for power development. In addition to the uncertainty of such an outcome and the high capital outlay involved, the development of these sources is handicapped by the absence of special mining legislation and by the large number of title holders to small-surface areas.

Part III.—THE PEOPLE OF NEW ENGLAND

New England has a higher proportion of city dwellers than any other major geographical section of the country. It has the greatest percentage of foreign born and people of foreign stock. Other characteristic features are presented here which portray the relationship of the New England population to the industrial life of the region.

The plan is first to show the distribution of the present population in the different sections and communities. An analysis is then presented of the make-up of the New England population, with particular consideration of the various foreign racial elements. Brief consideration is given also to a comparison of age and sex groupings within New England. Finally, the trend of growth in the New England population is considered as a whole and in respect to different sections within the area.

NUMBER AND DISTRIBUTION

It is difficult to give an accurate picture of the present population of New England, on the eve of the Federal Census of 1930, since reliance must be placed upon statistics of 1920. The reader should bear in mind that various population changes have taken place in New England within this interval.

The estimated population of the six New England States, as of July 1, 1927, was somewhat in excess of 8,100,000. According to the census of 1920 the population in that year was 7,400,909, comprising 7 per cent of the population of continental United States. At that time New England, which has only 2.1 per cent of the land area of the country, contained almost as many people as there were in the million square miles between Denver and the Pacific coast. The following table gives the population of the States of New England as of 1920, together with estimates for 1925 and 1927, including figures from the 1925 State census of Massachusetts and of Rhode Island.

Population of Individual States of New England

State	1920 [1]	1925	1927 [2]
Connecticut	1, 380, 631	[2] 1, 572, 000	1, 636, 000
Maine	768, 014	[2] 787, 000	793, 000
New Hampshire	443, 083	[2] 452, 000	455, 000
Massachusetts	3, 852, 356	[3] 4, 144, 959	4, 242, 000
Rhode Island	604, 397	[3] 679, 260	704, 000
Vermont	352, 428	[2] 352, 428	352, 428
Total	7, 400, 909	7, 987, 647	8, 182, 428

[1] United States census of 1920.
[2] Estimate, Bureau of Census, for July 1.
[3] State census.

RELATIVE DENSITY

New England as a unit is one of the most densely populated regions of the United States. In 1920, with a density of 119.4 persons per square mile, this region was three and one-third times as densely populated as the United States as a whole, and the 1927 estimate increases the figure to 132 persons per square mile. To distribute the inhabitants of these States in accordance with the average density

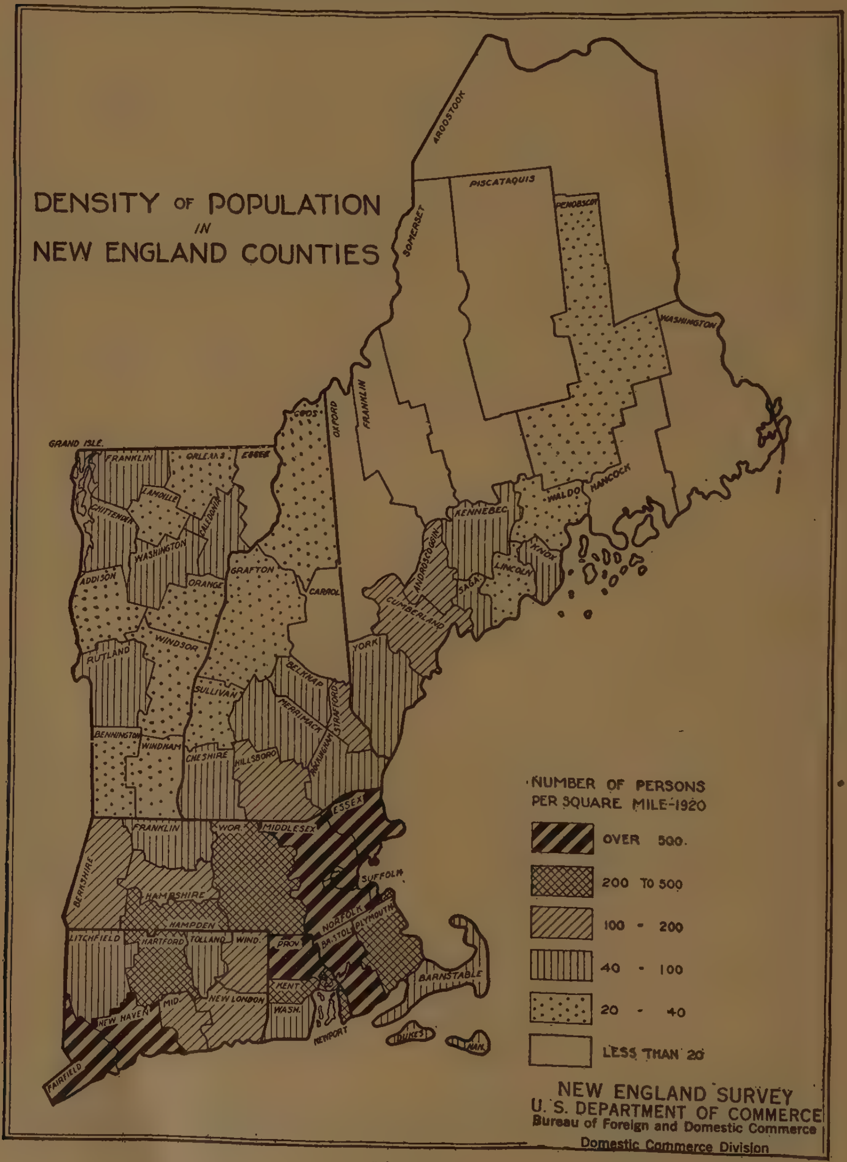
DENSITY OF POPULATION IN NEW ENGLAND COUNTIES
AROOSTOOK
PISCATAQUIS
SOMERSET
PENOBSCOT
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
KENNEBEC
ANDROSCOGGIN
WALDO
HANCOCK
KNOX
LINCOLN
SAGA.
CUMBERLAND
YORK
ESSEX
FRANKLIN
WOR.
MIDDLESEX
BERKSHIRE
HAMPSHIRE
SUFFOLK
HAMPDEN
NORFOLK
PLYMOUTH
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
BRISTOL
KENT
BARNSTABLE
MID.
NEW LONDON
WASH.
NEW HAVEN
NEWPORT
DUKES
NAN.
FAIRFIELD
NUMBER OF PERSONS PER SQUARE MILE-1920
OVER 500.
200 TO 500
100 - 200
40 - 100
20 - 40
LESS THAN 20
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division

Figure 12

prevailing outside New England would require an area comparable with that of Texas, or half again as large as the State of California.

Within New England, however, there are pronounced contrasts in the density of different areas. The contrast between the three northern States and the three southern States is much greater than that between New England as a whole and the rest of the United States. The character of New England population is dominated by the three States of the south, which account for nearly four-fifths of the total. Northern New England, with nearly four-fifths of the total area, has only a little more than one-fifth of the people of the entire group. In the northern group of States the average density in 1920 was only 33 persons per square mile, but in the southern group it was 419 per square mile. These contrasts reflect the great differences in urbanization and in industrial concentration.

Practically four-fifths of the total population of New England in 1920 was classified as urban, in comparison with slightly more than one-half for the entire United States. The density of different sections is mainly a reflection of the number and size of cities which they contain.

In point of density of population New Hampshire ranks twenty-first, Vermont twenty-seventh, and Maine thirty-first among the States of the Union. On the other hand, Rhode Island and Massachusetts, in southern New England, hold first and second places, respectively, and Connecticut fourth place.

URBAN AND RURAL AREAS

Nearly one-third of the total New England population in 1920 was in 11 cities of 100,000 population or more. More than half of the total was in 46 cities of 25,000 and above.

Of the population classified as rural, which includes all those living outside towns or incorporated places of 2,500 and above, nearly three-fifths in 1920 was located in Maine, New Hampshire, and Vermont. The population actually living on farms in New England was only 8.5 per cent of the total population for the region. This was the lowest for any geographical division except the Middle Atlantic States. The farm population in Maine, New Hampshire, and Vermont, however, comprised about one-fourth of the total in these States. In southern New England the farm population constituted only one-twentieth of the total.

New England contained, in 1920, 11 of the 68 cities of the United States having 100,000 or more inhabitants, and also 11 of the 76 cities with population between 50,000 and 100,000. Of the 22 New England cities then exceeding 50,000 in population, all but 2 were in southern New England. A summary of the distribution of population in cities, towns, and rural territory is shown for each State in the following table.

URBAN AND RURAL POPULATION IN NEW ENGLAND STATES IN 1920

Type of area	Total number in New England	Maine		New Hampshire		Vermont	
		Places	Per cent of State population	Places	Per cent of State population	Places	Per cent of State population
Urban	292	25	39.0	27	63.1	14	31.2
Cities of 100,000 and above	11						
Cities of 50,000 to 100,000	11	1	9.0	1	17.7		
Cities of 25,000 to 50,000	24	2	7.5	1	6.4		
Cities of 10,000 to 25,000	68	5	10.1	6	19.6	3	13.5
Cities of 5,000 to 10,000	85	11	9.9	6	9.9	6	11.8
Towns of 2,500 to 5,000	93	6	2.5	13	9.5	5	5.8
Rural			61.0		36.9		68.8
Places of less than 2,500	498	19	2.5	209	36.7	62	14.8
Other rural			58.5		.2		54.0

Type of area	Massachusetts		Rhode Island		Connecticut	
	Places	Per cent of State population	Places	Per cent of State population	Places	Per cent of State population
Urban	169	94.8	27	97.5	30	67.8
Cities of 100,000 and above	7	39.5	1	39.3	3	32.2
Cities of 50,000 to 100,000	6	12.1	1	10.6	2	10.9
Cities of 25,000 to 50,000	14	14.6	3	17.1	4	8.6
Cities of 10,000 to 25,000	39	15.4	6	15.9	9	11.0
Cities of 5,000 to 10,000	47	8.3	8	10.1	7	3.9
Towns of 2,500 to 5,000	56	4.8	8	4.4	5	1.2
Rural		5.2		2.5		32.2
Places of less than 2,500	185	5.2	12	2.5	11	.8
Other rural						31.4

MOVEMENTS AND MIGRATIONS

In 1870 17.3 per cent of the people born in New England were living in other parts of the country; in 1920 the proportion was 11 per cent. At the same time the percentage of native Americans coming to New England from other geographic divisions increased from 4 per cent to 8 per cent. In the decade ended with 1870 New England suffered a net loss from migrations totaling 454,311; for 1920 the net loss was 170,855. The important factor has been the migration into New England of persons born elsewhere in the United States, since there are now more natives of New England living outside than ever before. The number of natives of other sections living in New England has trebled since 1870.

In 1870 in the percentage of its native born who were living in other sections of the country New England was surpassed only by the Middle and South Atlantic and the East South Central States. In 1920 the New England percentage was lower than that of any other sections except the West South Central and the Pacific Coast States.

It may be concluded, therefore, that native New Englanders of the present day exhibit less tendency to seek homes elsewhere than do the natives of other sections of the United States.

MOVEMENTS WITHIN NEW ENGLAND

The increased facility of movement afforded by modern means of transportation and by economic opportunity would argue for considerable shifts of population from northern to southern New England. A phenomenon particularly noticeable throughout the Nation since the World War has been the rapid drift of rural population to the larger centers. Since most of the industrial centers of New England are in the southern portion, it would be logical to assume that there was an increasing drain from the north to the south. Figures indicate, however, that up to 1920 there had been no material shift in the balance of migrations between northern and southern New England, as is shown by the following table.

MIGRATIONS WITHIN NEW ENGLAND

Groups	1880	1900	1920
Natives of southern New England living in northern New England	43, 049	56, 376	79, 277
Natives of northern New England living in southern New England	163, 325	223, 496	239, 862

It is especially noteworthy that the proportion of persons born in New Hampshire and living in other New England States is nearly three times as great as that of natives of that State living in other sections of the United States. In 1920 there were 69,052 natives of New Hampshire living in Massachusetts alone, which comprised more than half of the total emigration from New Hampshire to other States. In Maine and Rhode Island, also, there were more persons migrating to other States of New England than to sections outside New England, and about half of these in each case went to Massachusetts. The figures for Vermont, Massachusetts, and Connecticut do not present a significant picture, since many persons from these three States bordering on New York migrate to that State. In fact, more natives of Massachusetts and Connecticut migrate to New York than to any other State. Of the natives leaving Vermont, one-third migrate to Massachusetts and most of the others go to New York State. The next table gives the proportions of each State's native-born population living in the State of birth, in other States of New England, and outside New England.

RESIDENCE OF NATIVES OF NEW ENGLAND IN 1920

[Percentages of native born of each State]

Group	Maine	New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut
Living in State of birth	74. 1	65. 6	61. 6	84. 1	77. 8	80. 2
Living in other States of New England	15. 5	25. 5	20. 0	6. 1	12. 9	6. 6
Living in United States outside New England	10. 4	8. 9	18. 4	9. 8	9. 3	13. 2

FOREIGN STOCK

New England has a higher proportion of foreign-born in its population than any other geographic section of the country. In actual numbers it was surpassed in 1920 only by the Middle Atlantic and the East North Central division. The foreign-born element of the New England population is relatively twice as great as that of the United States as a whole. The proportion of foreign born in New England was 25.5 per cent, and for the entire United States 13.2 per cent. With only 7 per cent of the Nation's population, New England has 13.5 per cent of its foreign born.

In regard to the country of birth New England differs to an important degree from other sections of the country. In New England a quarter of the foreign born are Canadians, one-half of them being of French blood. Their proportion in this section is six times that of the country as a whole.

Next to the French Canadians, the most important foreign stock is the Irish; this nationality represents one-seventh of all the foreign born and comprises nearly twice as great a proportion in New England as in the country as a whole.

Italians constitute one-eighth of the foreign born in New England, a proportion which is only slightly greater than that for the Nation as a whole. The Polish immigrants in New England are approximately half as numerous as those of Irish birth.

English and Scotch immigrants represent a slightly higher proportion than the Polish, and the proportion of Russians likewise is somewhat greater. The proportion of English and Scotch in New England is slightly higher than that for the whole country; the proportion of Poles is about the same, and that of Russians is somewhat lower. Besides these principal racial stocks in New England, there are other minor groups which are important in certain localities. The greater part of the foreign-born population is made up of six nationalities—Canadian, Irish, Italian, English, Russian, and Polish.

The foreign born represent more than 28 per cent of the population in the three southern States of New England. In the three northern States the proportion is considerably less, representing only 15.6 per cent. The contrast in these two main areas runs parallel to the existence of industrial centers, in which most of the foreign born live. They are concentrated to the greatest degree in the large manufacturing districts. This is shown by the percentages of foreign born in the leading cities. Over 40 per cent of the population of Lawrence and of New Bedford in 1920 were born outside the United States. From 35 to 40 per cent of the population of Fall River, of New Britain, of Woonsocket, and of Manchester, were foreign born. The cities with a foreign-born population of 30 to 35 per cent include Boston, Cambridge, Lowell, Holyoke, Bridgeport, Waterbury, Stamford, Pawtucket, Nashua, and Lewiston. In Lawrence the foreign born, with the inclusion of the native stock born of foreign parents, comprised 78.1 per cent of the population. They made up from 70 to 75 per cent of the population in Fall River, Holyoke, New Bedford, New Britain, and Woonsocket.

FOREIGN BORN, BY STATES

The following table shows the percentages of foreign born in each of the New England States in 1900 and in 1920. The second table shows the distribution of foreign born, according to their country of birth.

REGIONS OF BIRTH OF FOREIGN BORN IN NEW ENGLAND STATES, 1900 AND 1920

State or area	Percentages of total foreign born						
	Europe				Asia	The Americas	All other
	Total	North-western	Central and eastern	Southern			
United States:							
1920	85.4	27.5	44.1	13.7	1.7	12.4	0.5
1900	85.8	40.6	40.0	5.1	1.2	12.7	.3
New England:							
1920	70.5	30.4	23.3	16.8	1.6	26.1	1.8
1900	63.4	45.4	12.4	5.6	.5	35.6	.5
Maine:							
1920	29.6	16.1	9.2	4.3	.9	69.4	.1
1900	27.4	22.4	3.5	1.5	.4	72.0	.1
New Hampshire							
1920	41.3	19.4	13.6	8.4	1.0	57.5	.1
1900	32.7	26.7	4.9	1.2	.2	67.0	.1
Vermont:							
1920	43.1	20.9	11.1	11.1	.7	56.1	.1
1900	42.1	32.4	4.7	5.1	.4	57.4	.1
Massachusetts:							
1920	70.1	33.1	21.4	15.6	1.8	25.4	2.7
1900	63.9	47.6	11.1	5.2	.6	34.8	.6
Rhode Island:							
1920	74.3	37.0	13.0	24.4	2.1	21.2	2.3
1900	69.5	53.5	7.3	8.6	.6	29.4	.5
Connecticut:							
1920	91.1	27.6	41.1	23.1	1.0	6.9	.2
1900	87.8	51.6	27.9	8.4	.4	11.7	.2

PRINCIPAL FOREIGN STOCK IN NEW ENGLAND STATES IN 1920, BY COUNTRY OF BIRTH

Country of birth	New England				Distribution[1] of New England total, by States			
	Number	Per cent of United States total	Per cent of New England		Maine		New Hampshire	
			Total population	Foreign born	Number	Per cent	Number	Per cent
Canada	476,256	42.7	6.4	25.3	74,420	15.6	52,312	11.0
French	240,385	78.1	3.2	12.8	35,580	----------	38,277	----------
Other	235,871	28.9	3.2	12.5	38,840	----------	14,035	----------
Ireland	267,429	25.8	3.6	14.2	5,748	2.1	7,908	3.0
Italy	238,508	14.8	3.2	12.7	2,797	1.2	2,074	.9
Russia	147,371	10.5	2.0	7.8	3,763	2.6	3,467	2.4
England	147,320	18.1	2.0	7.8	5,153	3.4	4,368	3.0
Poland	131,378	11.5	1.8	7.0	1,717	1.3	3,997	3.0
Sweden	67,286	10.8	.9	3.6	2,026	3.0	1,886	2.8
Germany	51,129	3.0	.7	2.7	932	1.8	1,714	3.4
Scotland	47,501	18.7	.7	2.5	2,171	4.6	1,823	3.8
Portugal	40,302	57.6	.5	2.1	153	.4	142	.4
Lithuania	35,361	26.2	.5	1.9	1,032	2.9	1,017	2.9
Greece	32,186	18.3	.4	1.7	1,228	3.8	5,280	16.4
Austria	23,081	4.0	.3	1.2	305	1.3	389	1.7
Finland	19,543	13.0	.8	1.0	1,393	7.1	1,558	8.0
Hungary	15,187	3.8	.2	.8	72	.5	66	.4
All other	146,107	5.4	2.0	7.7	4,904	3.4	3,396	2.3
Total	1,885,945	13.5	25.5	100.0	107,814	5.7	91,397	4.8

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[1] Total southern New England (243,769)=12.9 per cent of New England total; total northern New England (1,642,176)=87.1 per cent of New England total.

PRINCIPAL FOREIGN STOCK IN NEW ENGLAND STATES IN 1920, ETC.—Contd.

Country of birth	Distribution of New England total, by States							
	Vermont		Massachusetts		Rhode Island		Connecticut	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Canada	24, 885	5. 2	263, 478	55. 3	36, 482	7. 7	24, 679	5. 2
French	14, 181		108, 691		28, 887		14, 769	
Other	10, 704		154, 787		7, 595		9, 910	
Ireland	2, 884	1. 1	183, 172	68. 5	22, 253	8. 3	45, 464	17. 0
Italy	4, 067	1. 7	117, 007	49. 1	32, 241	13. 5	80, 322	33. 6
Russia	1, 333	. 9	92, 034	62. 5	8, 055	5. 5	38, 719	26. 3
England	2, 197	1. 5	87, 085	59. 1	25, 791	17. 5	22, 726	15. 4
Poland	1, 726	1. 3	69, 157	52. 6	8, 158	6. 2	46, 623	35. 5
Sweden	1, 123	1. 7	38, 012	56. 5	6, 542	9. 7	17, 697	26. 3
Germany	630	1. 2	22, 113	43. 3	3, 126	6. 1	22, 614	44. 2
Scotland	1, 854	3. 9	28, 474	59. 9	5, 692	12. 0	7, 487	15. 8
Portugal	29	. 1	29, 191	72. 4	8, 999	22. 3	1, 788	4. 4
Lithuania	67	. 2	20, 789	58. 8	794	2. 2	11, 662	33. 0
Greece	167	. 5	20, 441	63. 5	1, 219	3. 8	3, 851	12. 0
Austria	283	1. 2	8, 098	35. 1	1, 307	5. 7	12, 699	55. 0
Finland	476	2. 4	14, 570	74. 5	320	1. 6	1, 226	6. 3
Hungary	264	1. 8	1, 387	9. 1	176	1. 2	13, 222	87. 1
All other	2, 573	1. 8	93, 540	64. 0	14, 034	9. 6	27, 640	18. 9
Total	44, 558	2. 4	1, 088, 548	57. 7	175, 189	9. 3	378, 439	20. 1

It should be borne in mind that the figures given above include only those born in other countries. Since their offspring becomes classified as native born, the proportion of native to foreign parentage is bound to increase, and the actual foreign-born population increases only by new arrivals. The actual numbers and proportions of the New England population that are made up of these various immigrant stocks are, therefore, much greater than the figures indicate.

CONCENTRATION OF FOREIGN BORN

Most of the foreign population of New England is concentrated in the industrial centers, where the people find employment in the mills and factories. The first large-scale immigration consisted of French families from Canada to provide labor for the textile mills. In most of the mill towns there are French communities of considerable size. These are particularly conspicuous in the Blackstone Valley, in Fall River, and in New Bedford; in the mill towns of Lowell, Lawrence, Nashua, and Manchester; in the Merrimack Valley; in Biddeford, Augusta, Waterville, and Lewiston, along the Kennebec River, and also in other parts of Maine. Outside the textile areas the French are not so numerous. There are relatively few of that nationality in western Connecticut and western Massachusetts. There has been considerable infiltration into the agricultural sections of northern New England, particularly northern Vermont and New Hampshire. There is also a region in northern Maine along the St. John River which has been occupied for generations by French families whose ancestors settled there in colonial times.

Italians are especially numerous in the cities of Connecticut and eastern Massachusetts. Polish communities exist in many of the industrial centers. There are also a number of agricultural communities, especially in the Connecticut River Valley, where Polish families are engaged in the growing of onions and tobacco. These, as well as the Italians, have engaged in truck gardening to a considerable extent around many of the cities.

Most of the Portuguese are located in the Cape district and Buzzards Bay region of southeastern Massachusetts and Rhode Island, where many of the descendants of fishermen are now engaged in farming. The Swedes and the Finns are concentrated for the most part in a few agricultural communities of northern New England. Some of them live in the stone-quarrying districts. In and about Worcester there is a considerable concentration of Swedish stock, which is now well assimilated into the general population. Communities of Syrians, Greeks, and Armenians are located in the leather-manufacturing towns north of Boston. About the industrial centers of New England there are a great many mixed communities, with half a dozen or more racial stocks represented side by side.

New England contains a smaller negro population than any other section of the country except the Mountain and Pacific States. It is scattered about the industrial regions, with some concentration in southeastern Massachusetts and in metropolitan Boston.

CHANGES IN REGIONS OF ORIGIN

Of the total foreign-born population of New England in 1920 there were 30.4 per cent born in northwestern Europe, principally Ireland, England, and Sweden. There were 26.1 per cent who were natives of the Americas, almost wholly of Canada. Southern Europe contributed 16.8 per cent, which came principally from Italy, Portugal, and Greece. Central Europe contributed 12.3 per cent, chiefly from Poland, Germany, and Austria. From eastern Europe came 10.9 per cent, mainly from Russia and Lithuania; Asia contributed 1.6 per cent, chiefly from Armenia and Syria; and 1.8 per cent were natives of other regions.

It is noteworthy that from 1900 to 1920 the proportion of foreign-born population from northwestern Europe showed a decline from 45.4 to 30.4 per cent; from the Americas it likewise fell off from 35.6 to 26.1 per cent. On the other hand, the proportion from central, eastern, and southern Europe increased from 18 per cent in 1900 to 40.1 per cent in 1920. These changes, of course, run generally parallel to the changes for the United States as a whole, but they show greater variation in the case of New England. The changes in the individual States and in New England as a whole during this interval are indicated in the table on page 135.

DISTRIBUTION OF FOREIGN POPULATION

MASSACHUSETTS

Massachusetts alone had nearly three-fifths of the total foreign-born population of New England in 1920. This State then contained the largest Canadian-born population of all the States of the United States, the second largest Irish, Scotch, and Greek; the third largest English, Lithuanian, and Finnish; the fourth largest Italian, Russian, and Swedish; and the sixth largest Polish population. In Suffolk County there were more foreign-born inhabitants than in the three States of northern New England, and nine-tenths of these were in

Boston. That county contained approximately 60,000 Irish, 50,000 Russians, 44,000 Canadians other than French, and 42,000 Italians. There were about 15,000 English born. In Chelsea there were some 17,000 foreign-born inhabitants, of whom nearly one-half were

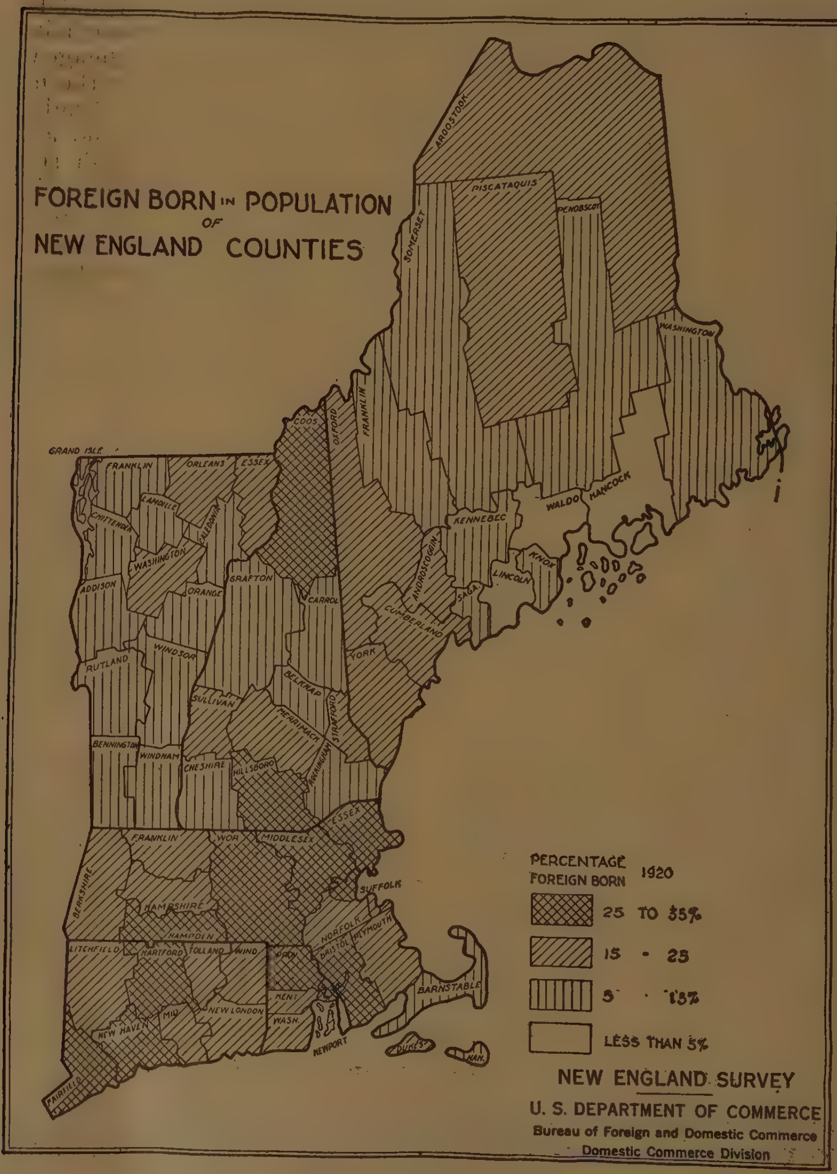
FOREIGN BORN IN POPULATION OF NEW ENGLAND COUNTIES
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
GRAFTON
ADDISON
ORANGE
CARROLL
KENNEBEC
WALDO
HANCOCK
KNOX
LINCOLN
SAGA.
ANDROSCOGGIN
CUMBERLAND
YORK
WINDSOR
RUTLAND
SULLIVAN
BELKNAP
STRAFFORD
MERRIMACK
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR
MIDDLESEX
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
NEWPORT
BARNSTABLE
NEW LONDON
MID.
NEW HAVEN
FAIRFIELD
DUKES
NAN.
PERCENTAGE FOREIGN BORN 1920
25 TO 35%
15 - 25
5 - 15%
LESS THAN 5%
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division

Figure 13

Russians. About three-fifths of the foreign-born population of Revere consists of Italians and Russians.

In Middlesex County, with over 200,000 foreign-born inhabitants, Cambridge and Lowell each had between 32,000 and 40,000 foreign born; Malden and Somerville had from 14,000 to 25,000; and Everett, Newton, and Medford had from 8,000 to 12,000. In Lowell there were more than 10,000 French Canadians, about 7,500 Irish, and nearly 4,000 each of Greeks, English, and Canadians other than French. In Cambridge the Canadians and Irish exceeded 14,000; Greeks and Poles ranked next in number. In Somerville the order of the foreign population was Canadian, Irish, and Italian, these comprising two-thirds of the foreign total.

In Essex County Canadians comprised about 30 per cent of the 138,000 foreign born. Italians and Irish numbered from 15,000 to 19,000; Russians, Poles, and English, from 9,000 to 13,000; and Scotch and Greeks, from 4,000 to 6,000. Of the 40,000 foreign born in Lawrence, Italians, Canadians, Irish, and English predominated, with populations between 4,000 and 9,000 each. In Lynn, with approximately 28,000 foreign born, Canadians predominated, and Irish and Russians followed. Salem and Haverhill each had between 11,000 and 14,000 foreign born. Canadians, Irish, and Polish predominated in the former city, and Canadians in the latter.

In Worcester County, which had 125,000 foreign born, nearly a fourth consisted of Canadians. In this county Swedes, Italians, and Irish numbered from 10,000 to 18,000; and Lithuanians, Finns, English, and Poles, from 5,000 to 10,000. This county had the largest Swedish and Lithuanian populations in Massachusetts. In the city of Worcester there were over 53,000 foreign-born inhabitants, among whom the Irish, Canadian, and Swedish predominated. In Fitchburg more than one-half of the 13,000 foreign born were Canadians and Finns.

Bristol County, in southeast Massachusetts, had approximately 120,000 foreign born, of which Canadians comprised 25.2 per cent, English 17.9 per cent, Atlantic islanders (Azores) 17.4 per cent, and Portuguese 13.5 per cent. Bristol County had more French Canadians than any other county in New England, and two-thirds of the Atlantic islanders of New England were in this county. There were also considerable numbers of Irish, Poles, and Russians. New Bedford, with a foreign-born population of 49,000, was surpassed in New England only by Boston, Providence, and Worcester. This foreign population was fairly evenly distributed among French Canadians, Atlantic islanders, English, and Portuguese. In Fall River, with a foreign-born population of 42,000, French Canadians predominated, with English, Atlantic islanders, and Portuguese next in importance. Fall River had the largest French-Canadian population of all Massachusetts cities, and New Bedford had the third largest. In number of the Atlantic islanders, New Bedford ranked first, Fall River second, and Taunton third.

In Norfolk County, of eastern Massachusetts, with some 53,000 foreign born, there were approximately 12,000 Canadians, a similar number of Irish, 7,000 Italians, and between 3,000 and 4,500 Swedes and English.

In Plymouth County, which had approximately 35,000 foreign born, the city of Brockton contained one-half of the total. The principal racial groups in the county were Canadian, Irish, and Italian, with minor numbers of Lithuanians, Russians, English, and Swedes.

In Barnstable County, which includes most of the Cape Cod region, there were about 4,000 foreign born, in which the Portuguese were the most numerous.

In western Massachusetts, Hampden County contained more than 80,000 foreign born, and of this number Springfield had 38.3 per cent, Holyoke 24.7 per cent, and Chicopee 14.9 per cent, respectively. In Springfield the foreign born were divided among the Irish, Italians, Russians, and French Canadians. In Holyoke French Canadians and Irish were the outstanding foreign elements, with a considerable Polish population. In Chicopee Polish predominated, with French Canadian second.

Hampshire County, including the city of Northampton, had some 16,000 foreign born, distributed in order of number principally among the Polish, French Canadian, and Irish.

Berkshire County, in western Massachusetts, had a foreign-born population of nearly 23,000, in which Italians, French Canadians, Irish, and Poles predominated. Pittsfield contained 36.1 per cent of the county total, and North Adams had 22.1 per cent. Italians and Irish prevailed in Pittsfield and French Canadians in North Adams.

RHODE ISLAND

Of the 173,500 foreign-born inhabitants of Rhode Island, the greater number were in Providence County. The predominant stock is Italian, followed in order by French Canadian, English, and Irish, with considerable numbers of Scotch, Portuguese, Swedish, Polish, and Russian stock. About half the total foreign born of Providence County are in the city of Providence. In Pawtucket, with a foreign-born population of 21,000, English comprised 27.5 per cent, Canadians 21.8 per cent, and Irish 13 per cent. In the neighboring town of Central Falls the French Canadians predominate. In Woonsocket, with a foreign-born population of 16,000, four-fifths of the total are French Canadians, and these represent the only sizable foreign element.

CONNECTICUT

The foreign born in Connecticut in 1920 numbered 376,513. The racial proportions were as follows: Italian, 21.2 per cent; Polish, 12.3; Irish 12.1; Russian, 10.3; English and German, 6 per cent each. Four-fifths of the State total of foreign born were in the counties of New Haven, Hartford, and Fairfield. No one of the other five counties had as many as 4,000 of any one nationality except Litchfield County, with upward of 4,000 Italians, and Windham County, with upward of 5,000 French Canadians.

Bridgeport, with more than 46,000 foreign born, had the largest foreign population among Connecticut cities, slightly surpassing New Haven. In the city of Hartford there were 40,000 foreign born, in Waterbury 29,000, in New Britain 21,000, and in Stamford 10,000. In Bridgeport, the predominant stocks, in order of numerical importance, were Italian, Hungarian, Russian, Irish, and English. In the city of New Haven the order of predominance was Italian, Russian, and Irish. In Hartford one-eighth of the total foreign born were Polish. In Waterbury the Italians were the most numerous.

In New Britain Poles and Italians predominated and formed one-half of the foreign population of that city. In Stamford the leading foreign-born element was Italian.

AGE, SEX, AND OCCUPATION

AGE GROUPS

In the distribution of population according to age, New England has a greater proportion of its people in the higher age groups than the United States as a whole. Thirty-nine per cent of New England's population in 1920 was 35 years of age or above, in comparison with 34 per cent for the entire United States. The average age (median) in New England was 28 years, in comparison with 25.2 years for the whole country. This section had a smaller percentage of its population in the groups below 25 years and a higher percentage in the groups above 45 years than any other geographical division except the Pacific. The proportion of inhabitants below 25 years of age was greater in southern New England, where the higher birth rate among the foreign population is an influential factor.

The age distribution in urban areas of New England did not differ greatly from that for urban areas of the United States; but in the rural areas of New England the proportion of inhabitants in the lower age groups was much smaller than in rural areas of the entire country. Among New England's rural inhabitants the proportion 45 years of age and above was considerably greater than for the Nation as a whole. The following table gives comparative figures of the distribution of total population by age groups in 1920 for New England and the United States, and comparisons of the respective urban and rural populations.

COMPARISON OF AGE GROUPS IN NEW ENGLAND AND IN ENTIRE UNITED STATES IN 1920

Age group	Percentage of total population		Percentage of urban population		Percentage of rural population	
	United States	New England	United States	New England	United States	New England
Under 5 years	10.9	10.2	9.7	10.2	12.3	10.0
5 to 14 years	20.8	18.3	17.9	18.1	23.9	19.0
15 to 24 years	17.7	16.3	50.9	48.3	43.5	41.7
25 to 44 years	29.6	30.5				
45 to 64 years	16.1	18.7	21.3	23.4	20.2	29.2
65 and over	4.7	5.8				
Age unknown	.1	.1	.2	.1	.1	.1
Proportion of population 35 years and above	34	39	--------	--------	--------	--------

SEX DISTRIBUTION

New England is unique among the geographical divisions in having in its total population a greater number of women and girls than of men and boys. This excess for the region as a whole arises, however, from a situation existing only in Massachusetts and Rhode

Island. In the urban populations, especially of the larger cities, women slightly outnumber the men. In the rural regions, on the other hand, the men materially outnumber the women. This situation reflects the opportunities for gainful employment for women and girls in the cities, which draw them away from the farms and smaller centers.

OCCUPATIONS

Fifty-four per cent of the New England population of 10 years and above was classified as engaged in gainful occupations, in comparison with 50 per cent for the United States as a whole. In Maine and Vermont the proportion was lower than in the national average; it ranged in the other States from 53 per cent in New Hampshire to 57 per cent in Rhode Island.

Women represented a considerably higher proportion of the total number of persons gainfully employed both in southern and northern New England than in the country as a whole. In the southern area 28.1 per cent of all employees were women, and in the northern States they comprised 22 per cent. The corresponding figure for the entire country was 20.5 per cent.

The manufacturing and mechanical industries in Connecticut, Rhode Island, Massachusetts, and New Hampshire engaged between 50 and 60 per cent of all persons gainfully employed; in Maine and Vermont the proportions were between 30 and 40 per cent. In northern New England 72 per cent of the male employees were engaged in the manufacturing and mechanical industries and in agriculture, forestry, and animal husbandry. In Maine approximately 25 per cent of all employees were engaged in agriculture, forestry, and animal husbandry; in New Hampshire, 16 per cent; and in Vermont, 32 per cent.

Transportation and trade in the three northern States engaged 17 per cent of the male employees. In southern New England the manufacturing and mechanical industries, together with trade and transportation, included more than three-fourths of all male employees.

TREND OF GROWTH

Comparison of the rates of growth of native born and foreign born in New England and in the United States as a whole is afforded in Figure 14. Very different relations are shown in the comparisons. For the foreign born, New England has experienced about the same rate of increase as the country as a whole in each decade since 1850. In the rate of increase of the native population, however, there is a very considerable contrast. This results not so much from the high rate of growth among the foreign born as from a relatively low rate of increase in the native stock.

CHANGES FROM 1850 TO 1920

At the time of the census of 1850, which was the first to distinguish between native-born and foreign-born inhabitants, the population of New England was 88.8 per cent native, in comparison with 90.2 per cent for the entire United States. The native stock of Maine and New Hampshire was far above the United States average, while that of Massachusetts and Rhode Island was considerably below the national figure. In the course of the next 70 years the native population of New England had little more than doubled, but during this interval its foreign-born population increased sixfold. Native born in 1920 constituted only about 75 per cent of the total New England population. The change has been radical in each of the New England States except Vermont, and has been pronounced in Connecticut

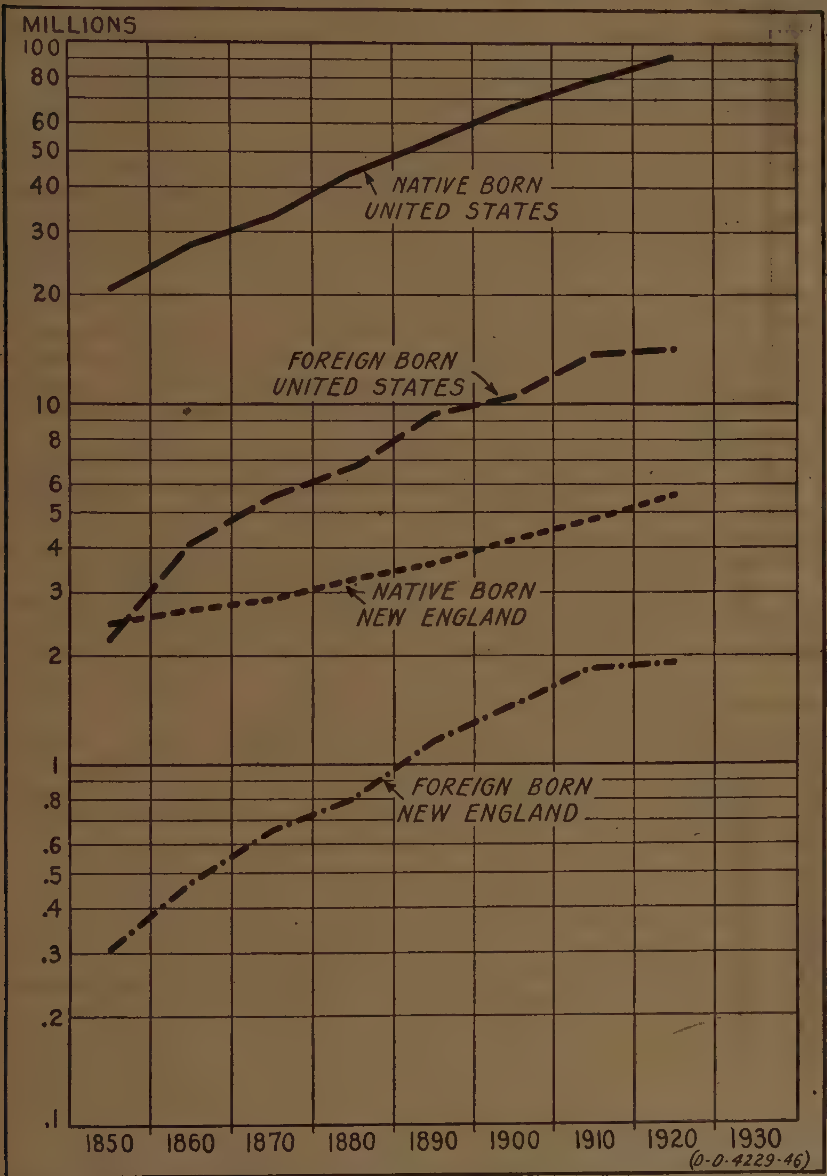

Figure 14.—Growth of native-born and foreign-born population in New England and in the United States as a whole

and New Hampshire, while Vermont has experienced even less change than the country as a whole. Figures of native population and of foreign born in 1850 and in 1920, for the New England States and the Nation as a whole, are shown in the next table.

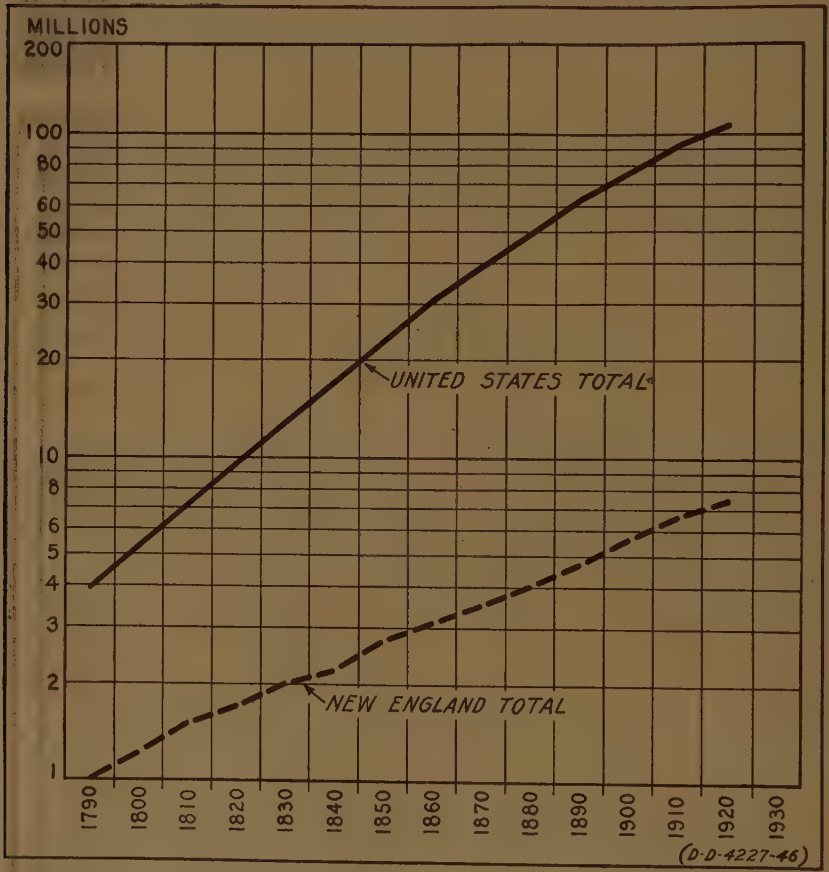

Figure 15.—Trend in growth of population in New England compared with trend in the United States as a whole

NATIVE AND FOREIGN-BORN POPULATION IN THE UNITED STATES AND IN NEW ENGLAND, 1850 AND 1920

State	Native		Foreign-born		Native as per cent of total	
	1850	1920	1850	1920	1850	1920
United States	20,912,600	91,789,900	2,244,600	13,920,700	90.2	86.8
New England	2,417,000	5,515,000	306,200	1,886,000	88.6	74.5
Maine	550,900	660,200	31,800	107,800	94.5	86.0
New Hampshire	303,500	351,700	14,300	91,400	95.2	79.4
Vermont	280,000	307,900	33,700	44,600	89.2	87.4
Massachusetts	827,400	2,763,800	164,000	1,088,600	83.2	71.7
Rhode Island	123,600	429,200	23,900	175,200	83.7	71.0
Connecticut	331,600	1,002,200	38,500	378,400	89.4	72.6

Source: U. S. Bureau of the Census.

Since 1790 the population of New England has increased at the average rate of a half million per decade. At the time of the first Federal Census New England had 1,009,408 inhabitants. In the next 60 years, ended in 1850, its population increased by 1,700,000. From 1850 to 1890 there was an increase of nearly 2,000,000. The increase in the three decades from 1890 to 1920 averaged about 900,000 in each 10-year period.

On account of the territorial expansion of the Nation southward and westward, the rate of increase of population in the country as a whole since the first Federal Census has been much greater than that for New England. Up to 1890, the Nation's rate of increase in nearly every decade was more than twice as great as the growth in New England. Since 1890, which marked the end of the period of great national expansion and settlement, the Nation's rate of growth has come to be practically the same as that of New England.

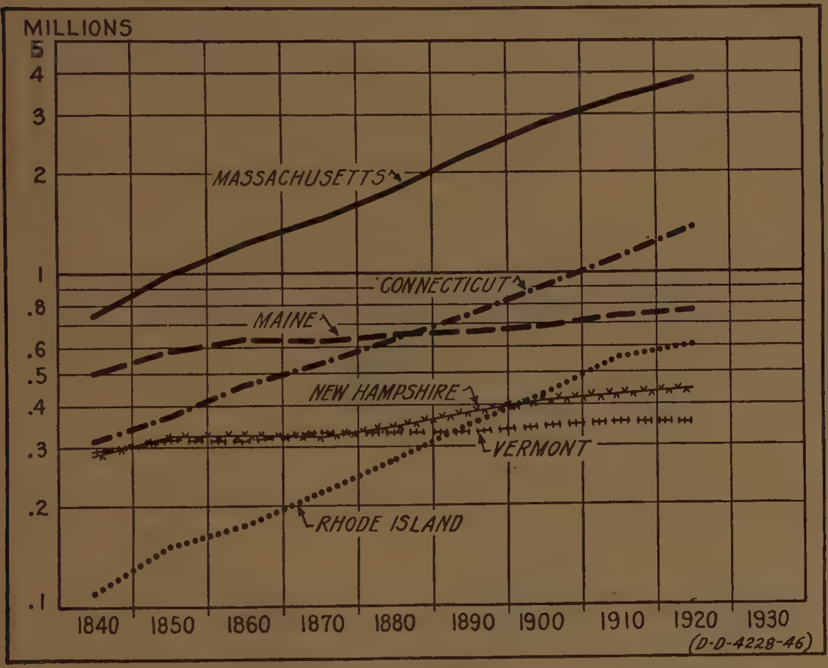

Figure 16.—Relative growth of population in individual States

CONTRASTS WITHIN THE AREA

A striking contrast has existed between the rate of growth of the three States of northern New England and that of Massachusetts, Rhode Island, and Connecticut. In northern New England, where manufacturing has never assumed importance, the rate of growth exceeded that of the Nation in most of the decades up to 1840. Since that time it has been continuously less. New Hampshire, the most highly industrialized State in this northern group, showed nearly a 10 per cent increase in a single decade, but the other two States remained at practically the same level for several decades. This condition of rapid early growth in these northern States, followed by a slowing down in later years to less than the national rate, is characteristic of sections in which agriculture and other extractive industries are the major activities.

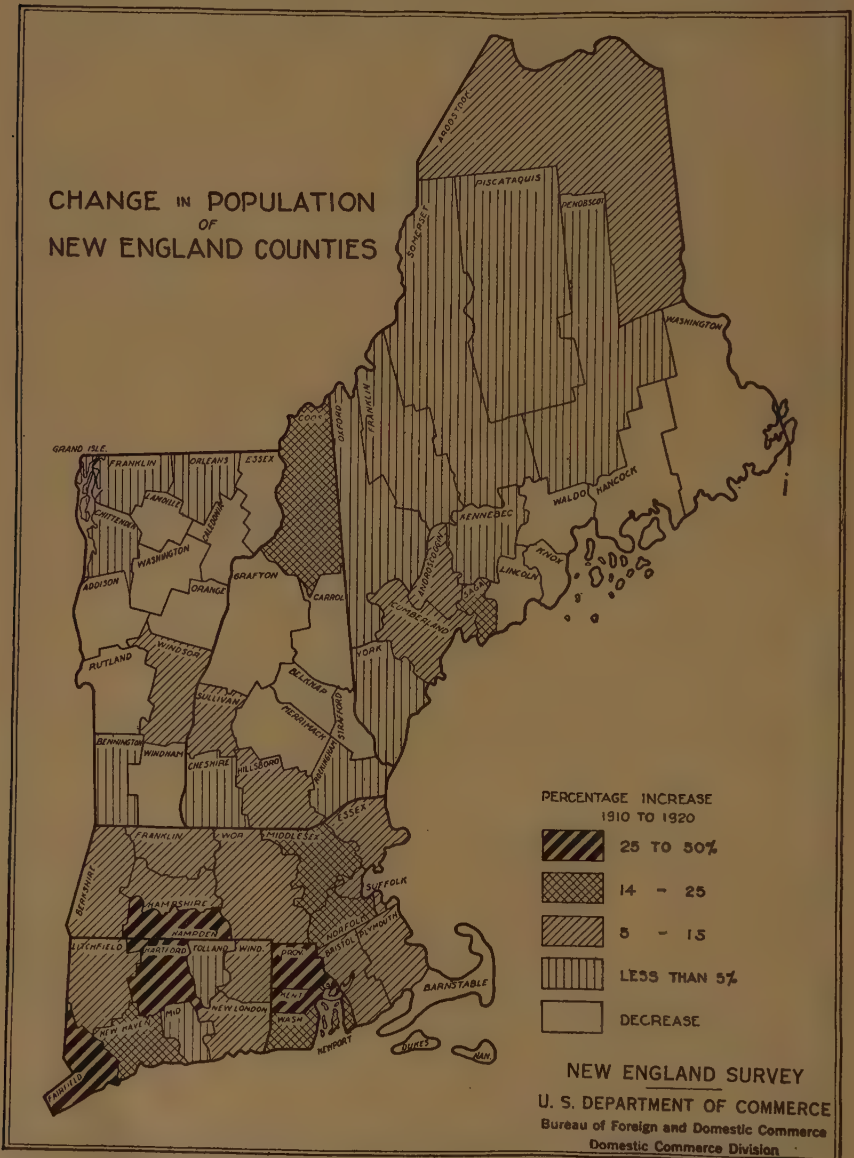
CHANGE IN POPULATION OF NEW ENGLAND COUNTIES
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
KNOX
LINCOLN
ANDROSCOGGIN
SAGA.
CUMBERLAND
YORK
GRAND ISLE.
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR.
MIDDLESEX
BERKSHIRE
HAMPSHIRE
SUFFOLK
HAMPDEN
NORFOLK
PLYMOUTH
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
BRISTOL
BARNSTABLE
KENT
MID
NEW LONDON
WASH
NEW HAVEN
NEWPORT
DUKES
NAN.
FAIRFIELD
PERCENTAGE INCREASE 1910 TO 1920
25 TO 50%
14 - 25
5 - 15
LESS THAN 5%
DECREASE
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division

Figure 17

In southern New England the rate of population increase since 1840 has been approximately the same as that for continental United States. In the period since 1890 it has risen somewhat higher. The growth of population in southern New England has run generally parallel to its industrial expansion.

Contrast between the northern and the southern States in rate of growth may be seen in Figure 17, showing the percentage of change in individual counties from 1910 to 1920. During this interval every county in the three southern States showed an increase, with the exception of the nonindustrial Cape district of Massachusetts. There were 6 counties whose population increased more than 25 per cent, and 5 others in which the increase exceeded 15 per cent. In the 40 counties of northern New England, on the other hand, there were 18 whose population decreased, and there were 13 others in which the increase was less than 5 per cent. The northernmost county of Maine increased 9.5 per cent as a result of the expansion of potato growing in that section; and the northernmost county of New Hampshire showed an even greater increase—17.4 per cent—a result of the establishment of paper mills in that section. With these exceptions, all the counties in the three northern States whose population increased more than 5 per cent in the decade from 1910 to 1920 were located along the southern border of those States and within the industrial belt of New England.

Part IV.—MANUFACTURES

INTRODUCTORY

The commerce of New England depends primarily upon the activities of its mills and factories, and the concentration of manufacturing in this great industrial section gives it outstanding national importance. New England industries provide great consuming markets for raw materials and industrial equipment. The products of these industries contribute in turn an important part of the goods that enter into the commerce of the Nation. An outstanding characteristic of New England economic life is the high proportion of its population whose incomes depend upon manufacturing. These incomes are expended, in large measure, to buy the products of other sections. An adequate commercial survey of New England requires, therefore, a broad knowledge of the manufacturing activities upon which its commercial life so largely rests.

Because of the lack of native raw materials, New England industries provide great consuming markets for the raw or semifinished products of other sections of the country. This region contains the principal wool market of the United States. The Nation's leading hide and leather market is located in New England. A substantial part of the American cotton crop is consumed by its textile mills. The region is important as a consumer of the ferrous and nonferrous metals.

A great portion of the food consumed by its industrial population is produced in other parts of the United States. New England also has to look to outside sources for its fuel supply. Its industries provide a great consuming market for coal to supply heat and power for its manufacturing processes. It consumes great quantities of petroleum products from outside sources. The extent of the dependence of New England upon sources outside its own borders for food, fuel, and raw materials for manufacture is indicated by the fact that the total tonnage of its inward shipments is about six times that of its outward shipments.[1]

As an offset for the great consuming market provided to the rest of the country for raw and partially finished products, New England factories and mills contribute a high proportion of the stock of many manufactured articles consumed in other sections. With only 7 per cent of the Nation's population, the manufacturing activities of the New England States contribute 11 per cent in the national income derived from manufacturing. In a number of important lines New England contributes well over half the entire national production, and there is a long list of articles in which its contribution far exceeds the share indicated by its population.

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[1] See External Trade of New England, by R. J. McFall, Domestic Commerce Series No. 22.

The industrial maturity of this great manufacturing region is indicated by the highly fabricated nature of its manufactures. It is distinguished as a region of fine manufactures. Its products are turned out mainly in finished form ready for the ultimate consumer. These products are highly individualized articles rather than those which lend themselves readily to great mass production.

Manufacturing is the keystone of New England's commercial structure. The prosperity of this region rests mainly upon the activity of its factories and mills. The first part of this section presents a summary of New England manufactures as a whole, giving a view of the nature and extent of manufacturing activity, its trend of development, and its importance in different localities within New England.

Considerable place, however, is given to a detailed consideration of individual lines of manufacture, discussed under the various major groups. The summaries of individual industries embody experiences of upward of 5,000 manufacturing plants, representing more than half the volume of all New England industries. The facts thus brought to light show how manufacturers have been dealing with conditions in the recent years of pronounced changes and adjustment. It is to be borne in mind that the rapid changes that have been taking place have resulted in substantial advances and improvements in many lines since these conditions were reported.

COMMERCIAL SIGNIFICANCE

The present treatment considers manufacturing activity as a source of income to the people of New England. The analysis is concerned mainly, therefore, with the contribution which the manufacturing processes make to the region. For this purpose the gross value of products is not a satisfactory measure, because only a part of this value is actually created within the industry. A large part of it is contributed by the value of the materials used. Moreover, the cost of materials contains a great deal of duplication on account of repetition in the different stages of manufacture. For indicating the importance of the manufacturing processes as a source of income to the people of New England, therefore, the value added by manufacture is much more accurate. This is calculated by deducting the cost of materials used from the value of the products. The value added by manufacture is used as the main basis of discussion throughout this analysis.

The income of the people of New England from manufacturing activity in 1927 was approximately 11 per cent of the total national income from this source, the total value contributed by all its manufacturing processes, outside of the cost of materials, approaching $3,000,000,000. This net income is to be distinguished from the gross value of all products of New England manufacture, including the cost of materials, which aggregated over $6,000,000,000 and comprised 9.6 per cent of the gross value for the entire United States. The per capita income from manufacturing in New England, derived by dividing the total value added by the estimated population, was approximately $364, while for the rest of the country, outside this area, it was $223, a difference of $141 per capita in favor of New England. This indicates the outstanding importance of manufactures to the well-being of this section.

The extent of the market provided by New England industries for goods purchased from outside sources or from within New England is shown in a rough way by the total cost of materials used in its manufactures. This market for materials amounted, in 1927, to $3,048,863,000, representing 9 per cent of the total United States outlay for manufacturing materials. This outlay includes the cost of purchased fuel, power, and supplies used in the various manufacturing processes, in addition to the cost of raw or semifinished materials.

The highly processed nature of New England manufacturing and its dependence on human labor are indicated by the high proportion of its wage earners and by the relationship of its wages to the United States total. The average number of workers on New England manufacturing pay rolls in 1927 was 13.2 per cent of the total number so employed throughout the United States, whereas New England's proportion of the total population was less than 7 per cent. In other words, there were 13 wage earners employed in manufacturing in every 100 persons of the New England population, while for the Nation as a whole, outside New England, there were only about half this number (7 persons) so employed in each 100 of population. The contribution of this section to the livelihood of wage earners is also distinctly higher than its proportion in the national manufacturing output. The total wage payments of New England manufactures, aggregating $1,328,650,000 in 1927, represented 12.3 per cent of the total wages paid by all manufacturing in the United States, while its share in the gross value of manufactured products was only 9.6 per cent.

The general relation of New England manufacturing activity in 1927 to that of the entire United States is shown in the following table. This shows its relatively high share of wage earners and of wages paid, in proportion to the New England population, and its relatively low proportion in the total cost of materials. The value added by manufacture thus represents a considerably higher proportion of the national total than does the value of the product. In the number of establishments the New England proportion is about the same as its share represented by the gross value of its products

New England Compared with Entire United States in Total Manufacturing Activity in 1927

Item	New England	Total, United States	New England's percentage
Number of manufacturing establishments	17, 745	191, 866	9. 3
Number of wage earners	1, 098, 748	8, 353, 977	13. 2
Wages paid	1, 328, 650, 000	10, 848, 803, 000	12. 3
Cost of materials	3, 048, 863, 000	35, 133, 137, 000	8. 7
Value of products	6, 028, 475, 000	62, 718, 347, 000	9. 6
Value added by manufacture	2, 979, 612, 000	27, 585, 210, 000	10. 8
Population (estimate for July 1, 1927)	8, 182, 428	118, 628, 000	6. 9

WAGES AND PRODUCTION IN NEW ENGLAND

The next table gives figures for the four geographic divisions of States which contain the greater part of the country's manufacturing—New England, the Middle Atlantic division (New York, New Jersey, and Pennsylvania), the east North Central division (Ohio, Indiana, Michigan, Illinois, Wisconsin), and the South Atlantic division (Delaware, Maryland, West Virginia, North Carolina, South Carolina, Georgia, Florida).

The figures show, for each of these sections and for the entire United States, average wages per wage earner, average value added per wage earner, and average value of gross product per wage earner. These averages per wage earner are derived by dividing the figures for total wages, total value added by manufacture, and total value of product, respectively, in each geographic division, by the total number of wage earners for that division, as reported in the 1925 census. It is to be borne in mind that no allowance is made for possible differences in the proportion of men and women employed in these different sections, nor for differences in the type of work performed. Neither are differences in regularity nor seasonality of employment considered, such as might result from strikes or seasonal activity. It should be borne in mind also that these figures take account of a single year only, in which special conditions may have been significant in some sections.

The average wage per wage earner shows the average compensation which the individual worker receives for all manufacturing in a given region. The average value added per wage earner shows what the effort of the individual worker contributes to the income of the region. The average value of product per wage earner indicates the value of marketable goods which is turned out as a result of the wage earner's efforts. This includes, of course, the cost of material and the value which the wage earner adds to this material.

The degree to which mechanical power enters into the manufacture of goods in the different manufacturing sections of the country is shown in the lower part of this table. The average value added per horsepower is derived by dividing total value added by all manufacturing in the region by the total installed horsepower in that region. This shows the contribution made by power equipment to the manufacturing income of the region. The average value of product per horsepower is derived by dividing the total gross value of all manufactured goods by the total installed horsepower in the region. This shows the gross value of marketable product for each horsepower of installed equipment.

Comparison of New England and Other Manufacturing Sections in Average Production and Wages per Wage Earner and in Production per Horsepower in 1925

Annual average	New England	Middle Atlantic division	East North Central division	South Atlantic division	Entire United States
Average wages per wage earner	$1, 194. 00	$1, 379. 00	$1, 428. 00	$902. 00	$1, 280. 00
Average value added per wage earner	2, 617. 00	3, 503. 00	3, 526. 00	2, 363. 00	3, 194. 00
Average value of product per wage earner	5, 491. 00	7, 792. 00	8, 121. 00	5, 405. 50	7, 480. 00
Average value added per horsepower	675. 00	863. 50	822. 00	574. 00	748. 50
Average value of product per horsepower	1, 417. 00	1, 920. 50	1, 893. 50	1, 313. 00	1, 753. 00

TYPES OF MANUFACTURES

The diversity of New England manufactures is greater than is generally appreciated. New England is associated in the popular mind largely with textiles. This viewpoint has been given emphasis for so long that the general public does not appreciate the fact that textiles comprise but slightly more than one-fourth of the total industrial activity of the region, and that other manufactures outweigh the importance of textiles nearly 3 to 1. Again, the prosperity of New England has been regarded by many to hang upon the boot and shoe industry; yet all the leather industries, together with all the rubber manufactures of the region, comprise less than 12 per cent of the contribution made by all of New England's factories and mills. All leather and rubber manufactures have only a little over one-third the importance of all the metal industries and less than one-half the importance of textiles.

It is a fact not generally recognized that the industries in which metals are the principal material are of more significance to New England, as a source of income, than all the textile manufactures. This includes the various kinds of machinery, iron and steel manufactures, the nonferrous metals, and jewelry. These metal industries overshadowed textiles by nearly $138,000,000 in the value added by manufacture, and made up nearly 32 per cent of the New England total in 1925. The metal-using industries thus mean more to the region as a source of income than the industries depending upon any other kind of basic material. Indeed, the metal industries account for nearly one-third of the contribution of all New England manufacturing.

The industries included under metals, textiles, leather, and rubber comprise together about 71 per cent of the total New England income from manufacturing. The remaining manufactures of New England have a collective importance greater than that of textiles, comprising 29 per cent of the New England total in comparison with 27 per cent for textiles. Paper and printing are of substantial importance, with approximately 10 per cent of the New England total. The manufacture of foodstuffs is of approximately equal importance to the chemical industries, these two groups together making up nearly 10 per cent additional.

The contribution by other industries not included in the groups heretofore mentioned comprises somewhat over 9 per cent of the New England total income from manufactures. In the remaining groups the principal ones are manufactures in which wood is the basic material, and stone products, with respective contributions of over 3 and over 2 per cent. Miscellaneous products not included in any classified group make up a little over 3 per cent of the total. Manufactures of transportation equipment were slightly less than 2 per cent. The remaining portion, amounting to somewhat less than 2 per cent of all manufacturing, includes the products of railroad repair shops, the making of musical instruments, and tobacco manufactures.

The relative importance of the major groups of manufactures, based upon the nature of the principal materials used, may be readily seen from the next table. In the last two columns the total contribution of each to the New England income, as indicated in the value added by manufacture, is given in dollars and in percentage of the total. The other columns afford comparisons of number of establishments, wage earners and wages paid, cost of materials, and total value of the output. These groups of manufactures are made for convenience in comparing different broad types of industry. Each group contains numerous lines of manufacture which are treated separately further on in this report. The relative importance of the broad groups is shown in Figure 18.

The figures for the major groups of New England manufactures afford some exceedingly significant comparisons of the number of establishments, wage earners and wages, cost of materials, and output.

The number of establishments in the metal industries greatly surpasses the number engaged in textile manufacture. Establishments engaged in making foodstuffs also exceed the number in textile manufacture and are not greatly below the number engaged in metal manufactures.

The number of wage earners employed in the textile industries surpasses considerably the number engaged in metal manufactures. These two groups, metals and textiles, together accounted for 65 per cent of all the wage earners employed in New England manufacturing. In the amount of money paid in wages textiles surpassed the metal industries by a relatively slight amount. Each of these groups contributed slightly less than one-third of the total wages paid in all New England manufactures.

When cost of materials is considered there is a conspicuous contrast between the metal industries and the textile group. The total for metals was only slightly more than half the total cost of materials for the textile industries; yet the metal industries contributed considerably more to the New England income from manufacturing than did the textiles. The value added by manufacture in the metal industries was considerably greater than its cost of materials, the latter representing about 42 per cent of the total product, while value added in the processes of manufacture was 58 per cent. With textiles the condition is reversed, the cost of materials being much greater than the value added by manufacture. Materials comprised about 60 per cent of the total value of the product, while the processes of manufacture contributed only 40 per cent.

The industries in the paper and printing group show pronounced contrasts between proportions in the number of establishments, the number of wage earners, and the value of the output. There is a relatively high proportion in the number of establishments and a low proportion of wage earners, thus indicating the prevalence of small-size establishments in this line, and a relatively small number of wage earners. The outlay for wages and the cost of materials were both low in proportion to the contribution which this group made to the total of New England industry. The paper and printing group represents two distinct forms of activity. Paper manufacture is prevailingly a large-scale operation, while printing establishments are relatively small. Hence these contrasts are concealed when the two are combined in a major group.

In the manufacture of foodstuffs the number of establishments is a far greater proportion of the New England total than is the contribu-

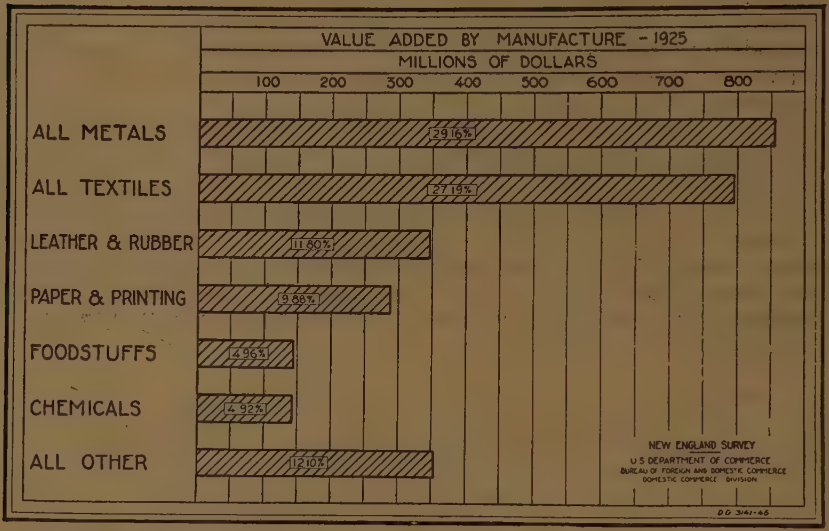

Figure 18.—New England manufactures grouped according to nature of materials

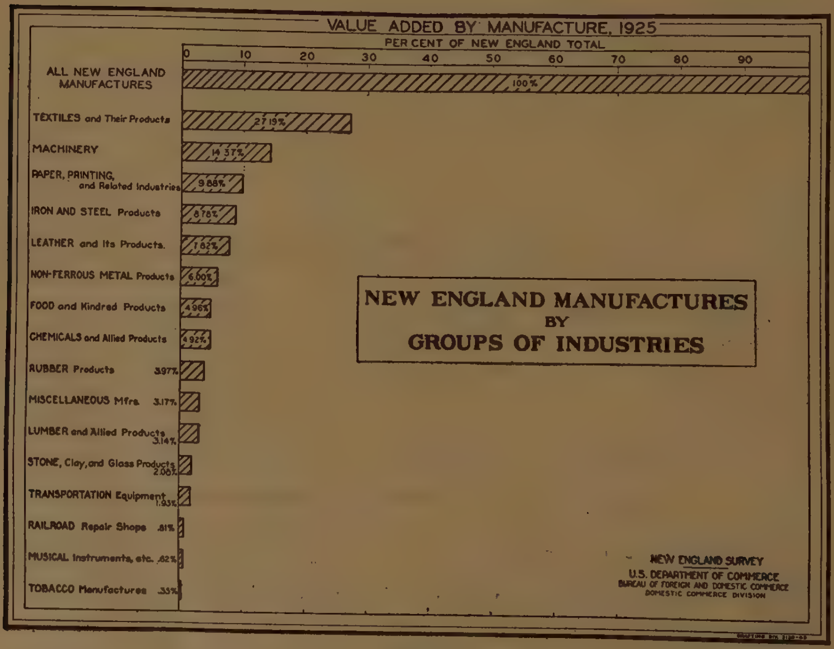

Figure 19

tion of this group to the total value added by manufacture. The proportions of wage earners and of wages were relatively low. In contrast, the cost of materials was relatively high. The contribution of foodstuffs to the total product of New England manufactures and to the income therefrom was thus considerably greater than its proportion of wage earners and wages.

In the manufacture of chemicals the proportion of wage earners and of wages was also relatively low in the contribution which this group made to the New England income from manufacturing. The remaining industries not included in these designated groups made up a decidedly high proportion of the number of establishments, comprising over 21 per cent of the New England total. But their contribution to the income from manufacturing, 9.3 per cent of the New England total, was relatively high in comparison with the cost of materials which they used.

IMPORTANCE OF MAJOR GROUPS OF NEW ENGLAND MANUFACTURES

[Ranked by nature of materials according to value added by manufacture in 1925]

Rank	Nature of material	Establishments		Wage earners		Total wages	
		Number	Per cent	Average number	Per cent	Thousands of dollars	Per cent
1	Metal and related industries	3, 662	20. 2	317, 025	28. 2	427, 183	31. 9
2	Textiles	2, 579	14. 2	412, 544	36. 8	435, 736	32. 5
3	Leather and rubber	1, 464	8. 1	139, 466	12. 4	158, 767	11. 8
4	Paper and printing	2, 349	12. 9	79, 838	7. 1	108, 003	8. 1
5	Foodstuffs	3, 498	19. 2	40, 706	3. 6	48, 297	3. 6
6	Chemicals	671	3. 7	26, 418	2. 4	34, 221	2. 6
	All other	3, 950	21. 7	106, 219	9. 5	127, 102	9. 5
	Total New England	18, 173	100. 0	1, 122, 216	100. 0	1, 339, 309	100. 0

Rank	Nature of material	Cost of materials		Value of products		Value added by manufacture	
		Thousands of dollars	Per cent	Thousands of dollars	Per cent	Thousands of dollars	Per cent
1	Metal and related industries	676, 365	21. 0	1, 613, 126	26. 2	936, 761	31. 9
2	Textiles	1, 212, 488	37. 6	2, 010, 896	32. 6	798, 408	27. 2
3	Leather and rubber	406, 798	12. 6	753, 166	12. 2	346, 368	11. 8
4	Paper and printing	264, 427	8. 2	554, 399	9. 0	289, 972	9. 9
5	Foodstuffs	289, 730	9. 0	435, 281	7. 1	145, 551	5. 0
6	Chemicals	153, 083	4. 7	297, 407	4. 8	144, 324	4. 9
	All other	221, 966	6. 9	496, 735	8. 1	274, 769	9. 3
	Total New England	3, 224, 856	100. 0	6, 161, 009	100. 0	2, 936, 153	100. 0

AVERAGE SIZE AND OUTPUT OF ESTABLISHMENTS

The relative importance of the individual establishment in these major groups of manufacture is indicated in the next table, where the factors of wage earners, wages, cost of materials, value of products, and value added by manufacture are given as an average per establishment. The prevailing large size of textile establishments is indicated by the high average number of wage earners, as well as by the wages paid per plant, by the cost of materials, and the value of the output. In each of these items the average per establishment is higher for textiles than that for any other group.

In wages paid per establishment the metal industries rank next after textiles. The leather and rubber group exceeds the metals group in the average number of wage earners per plant. In the average cost of materials used per plant metals are surpassed not only by textiles and by the leather and rubber group, but by the chemicals group as well. In the average value of output per plant metals are surpassed by textiles and by leather and rubber, but in the average value added by manufacture metals are surpassed only by textiles.

Average Size and Output per Plant in Major Groups of New England Manufacture in 1925

Nature of material	Total number of establishments	Average per establishment				
		Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Metal and related industries	3, 662	86. 5	$116, 653	$184, 698	$440, 504	$255, 806
Textiles	2, 579	160. 0	168, 955	470, 139	779, 719	309, 580
Leather and rubber	1, 464	95. 3	108, 447	277, 867	514, 458	236, 590
Paper and printing	2, 349	34. 0	45, 978	112, 570	236, 015	123, 445
Foodstuffs	3, 498	11. 6	13, 807	82, 827	124, 437	41, 610
Chemicals	671	39. 3	51, 000	228, 142	443, 230	215, 088
All other	3, 950	26. 9	32, 178	56, 194	125, 756	69, 562
All New England manufacturing industries	18, 173	61. 8	73, 698	177, 453	339, 020	161, 567

PRODUCTION PER WAGE EARNER IN MAJOR GROUPS

The factors of wages, cost of materials, value of product, and value added by manufacture are shown as an average per wage earner in the next table. In average wages per wage earner there are relatively slight differences among the paper and printing group, the metals group, and chemical manufactures. These three groups stand out considerably above the others. The textile manufactures come lowest of all. In comparing the average wages in different groups, it should be borne in mind that the figures take no account of distinctions in the degree of skill and workmanship involved in the different lines of manufacture; neither are the proportions of male and female workers considered, nor the differences in seasonality of employment. There are great contrasts among these groups in these three respects.

The average cost of materials per wage earner reflects the degree to which human labor enters into the manufacturing process. The lower this cost of materials the greater is the contribution by labor in the product. In this respect the three leading groups—metals, textiles, leather and rubber—are greatly overshadowed by the foodstuffs and the chemicals groups, and to a lesser degree by the paper and printing group. In the metals group the cost of materials per wage earner is below that in any other specified major group and far below the general average for all New England manufacturing. In textiles, and in the leather and rubber group, the cost of materials per wage earner is somewhat above the New England average. Foodstuffs stand far above the other major groups in cost of materials per wage earner.

The average value of product per wage earner takes into account not only the purchased material, but also what the worker adds to its value. In this respect foodstuffs and chemicals stand out far above any of the other groups; this would be expected from the high cost of materials per worker in these two groups. Textiles are considerably below the New England average in value of product per worker. Both the metals group and the leather and rubber group are somewhat below the average for all New England manufactures.

The value which the effort of the wage earner contributes in the manufacturing process is the most significant indication of his productiveness. Here the chemicals group stands out far above any of the others. Paper and printing and the group of foodstuffs manufactures are also conspicuously high. The metals group is above the New England average for all manufactures. The textiles group, on the other hand, is far below the average and is the lowest in the whole series.

AVERAGE PRODUCTION PER WAGE EARNER IN MAJOR GROUPS OF NEW ENGLAND MANUFACTURE IN 1925

Nature of material	Total number of establishments	Total number of wage earners	Average per wage earner			
			Wages	Cost of materials	Value of products	Value added by manufacture
Metal and related industries	3, 662	317, 025	$1, 347	$2, 133	$5, 088	$2, 955
Textiles	2, 579	412, 544	1, 056	2, 939	4, 874	1, 935
Leather and rubber	1, 464	139, 466	1, 138	2, 917	5, 400	2, 484
Paper and printing	2, 349	79, 838	1, 353	3, 312	6, 944	3, 632
Foodstuffs	3, 498	40, 706	1, 186	7, 118	10, 693	3, 576
Chemicals	671	26, 418	1, 295	5, 795	11, 258	5, 463
All other	3, 950	106, 219	1, 195	2, 088	4, 672	2, 584
All New England manufacturing industries	18, 173	1, 122, 216	1, 193	2, 874	5, 490	2, 616

DIVERSITY OF OUTPUT

The diversity and the broad range of manufacturing activity in New England are indicated by the fact that there were 221 lines of its manufactures which were of sufficient size to be included in the census tabulations for 1927, comprising nearly two-thirds of the 348 separate classifications for the whole United States. There were 108 distinct lines of manufacture, each of which contributed over $3,000,000 to the New England income. In each of 84 of these separate lines over $5,000,000 was contributed to the value added by manufacture. There were 52 classes in this list in which upward of $10,000,000 was contributed to the New England income. Going on up the scale, there were 30 of these industries contributing upward of $20,000,000 each, and in each of 14 separate lines the value added by manufacture exceeded $50,000,000. Each of the five leading lines of New England industry contributed over $125,000,000 to the region's income, and one of these, that of cotton goods, exceeded $250,000,000. Contributions of each of the 30 leading industries in 1925 are shown in Figure 20.

The table on page 160 presents in compact form (*a*) the position of each of the 108 lines of industry, arranged in the order of importance of their contribution to the New England income in 1927; (*b*) total value of the product of each industry; (*c*) value added by manufacturing; (*d*) value added by manufacture as a percentage of the New England total for all manufacturing; and (*e*) value added by manufacture as a percentage of the United States total for the specific industry. Industries whose totals in separate States can not be shown without disclosing operations of individual establishments are excluded from the table.

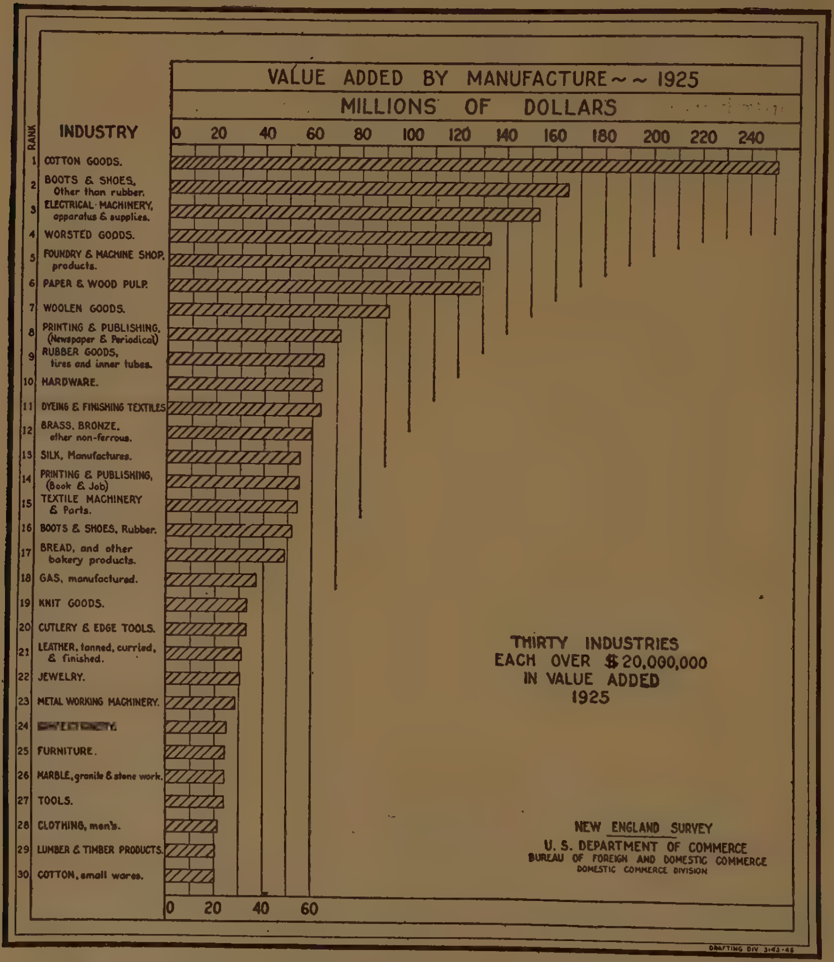

Figure 20.—Leading manufactures of New England

It is seen that cotton goods, the largest single line of manufacture, contributed only 8.6 per cent of the total New England income from manufacturing. Next to this came boots and shoes, other than rubber, with 5.2 per cent, followed by electrical machinery, with 4.9 per cent; foundry and machine shop products, with 4.8 per cent; worsted goods, 4.3 per cent. These five outstanding lines, each of which contributed over $125,000,000 to the New England income for manufacturing, together comprised only 27.8 per cent of the New England total. The next seven items in their importance in New England were paper; woolen goods; printing and publishing of newspapers and periodicals; dyeing and finishing textiles; brass, bronze, and other nonferrous products; rubber goods (other than boots and shoes) and rubber tires and inner tubes; book and job printing and publishing. The first 12 industries comprised 44.4 per cent of the New England total; the addition of the next 2 industries—bread and other bakery products, and textile machinery—brings the contribution of the first 14 industries in this list up to 48 per cent of the total for all New England manufactures. Each one of these 14 industries made a contribution to the New England income exceeding $50,000,000.

RANK OF 108 LEADING INDUSTRIES OF NEW ENGLAND ACCORDING TO VALUE ADDED BY MANUFACTURE IN 1927

	Industry[1]	States included	Value of products in New England (thousands of dollars)	Value added by manufacture			
				New England (thousands of dollars)	United States (thousands of dollars)	Per cent of all New England industries	Per cent of United States total for named industry
1	Cotton goods	All New England	519, 219	256, 413	695, 809	8. 61	36. 9
2	Boots and shoes other than rubber	Maine, Massachusetts, New Hampshire	324, 033	154, 387	450, 161	5. 18	34. 3
3	Electrical machinery, apparatus, and supplies	Connecticut, Massachusetts, New Hampshire, Rhode Island.	229, 516	144, 595	991, 545	4. 85	14. 6
4	Foundry and machine shop products n. e. c.	All new England	207, 951	142, 319	1, 387, 004	4. 78	10. 3
5	Worsted goods	Connecticut, Maine, Massachusetts, Rhode Island	357, 358	128, 983	187, 262	4. 33	68. 9
6	Paper	Connecticut, Maine, Massacushetts, New Hampshire, Vermont.	229, 172	92, 979	347, 106	3. 12	26. 8
7	Woolen goods	All New England	185, 946	81, 280	128, 609	2. 73	63. 2
8	Printing and publishing, newspaper and periodical	do	110, 287	78, 752	1, 175, 262	2. 64	6. 7
9	Dyeing and finishing textiles	Connecticut, Massachusetts, Rhode Island	141, 218	65, 406	195, 366	2. 20	33. 5
10	Brass, bronze, and other nonferrous alloys, and copper	Connecticut, Massachusetts, New Hampshire, Rhode Island.	166, 144	60, 844	192, 288	2. 04	31. 6
11	Rubber goods and tires and inner tubes	Connecticut, Massachusetts, Rhode Island	140, 914	59, 358	483, 472	1. 99	12. 3
12	Printing and publishing, book and job	All New England	75, 454	57, 312	655, 982	1. 92	8. 7
13	Bread and other bakery products	do	113, 662	55, 651	701, 464	1. 87	7. 9
14	Textile machinery and parts	Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont.	72, 586	50, 450	80, 740	1. 69	62. 3
15	Hardware, n. e. c.	Connecticut, Massachusetts, Rhode Island	71, 435	48, 901	136, 377	1. 64	35. 9
16	Silk manufactures	do	118, 230	48, 896	304, 733	1. 64	16. 0
17	Gas, manufactured, illuminating and heating	All New England	64, 348	37, 734	304, 920	1. 27	12. 4
18	Boots and shoes, rubber	Massachusetts	56, 440	37, 483	81, 235	1. 26	46. 1
19	Knit goods	All New England	72, 186	34, 568	392, 521	1. 16	8. 8
20	Cutlery and edge tools, not including silver and plate	Connecticut and Massachusetts	42, 136	33, 806	57, 562	1. 13	58. 7
21	Jewelry	Massachusetts, Rhode Island	62, 232	33, 439	87, 950	1. 12	38. 0
22	Leather, tanned, curried, and finished	Connecticut, Maine, Massachusetts	79, 936	30, 723	162, 271	1. 03	18. 9
23	Metal-working machinery, including machine tools	Connecticut, Massachusetts, New Hampshire, Vermont	40, 308	28, 017	134, 286	. 94	20. 9
24	Furniture, including store and office fixtures	All New England	49, 060	27, 157	490, 317	. 91	5. 5
25	Granite, marble, slate, and stone work	do	40, 178	27, 047	134, 853	. 91	20. 1
26	Tools, not including edge tools, machine tools, files, or saws.	Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont.	33, 490	23, 268	80, 374	. 78	28. 9
27	Confectionery	Connecticut, Maine, Massachusetts, Rhode Island	53, 448	22, 846	173, 555	. 77	13. 2
28	Clothing, women's, exclusive of corsets and allied garments and garments made in knitting mills.	Connecticut, Massachusetts, New Hampshire, Rhode Island.	44, 381	21, 277	684, 881	. 71	3. 1
29	Cotton small wares	do	41, 364	21, 104	32, 598	. 71	64. 7
30	Typewriters and supplies	Connecticut	26, 135	20, 928	53, 156	. 70	39. 4
31	Clothing (except work clothes) men's, youths', and boys'	Connecticut, Maine, Massachusetts, New Hampshire	38, 417	19, 390	484, 937	. 65	4. 0

32	Soap	Massachusetts, Rhode Island	34, 483	19, 367	114, 816	.65	1[illegible].9
33	Plated ware	Connecticut, Massachusetts	30, 575	18, 858	36, 508	.63	51.7
34	Steam-fitting and steam and hot-water heating apparatus	Connecticut, Massachusetts, Rhode Island	26, 678	18, 676	148, 323	.63	12.6
35	Hats, fur felt	Connecticut, Massachusetts	39, 121	18, 218	48, 195	.61	37.8
36	Boxes, paper and other, n. e. c	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island.	36, 105	17, 693	138, 091	.59	12.8
37	Lumber and timber products, n. e. c	All New England	30, 716	16, 299	720, 687	.55	2.3
38	Pulp (wood and other fibers)	Maine, New Hampshire, Vermont	59, 865	16, 226	66, 873	.54	24.3
39	Boot and shoe findings not made in boot and shoe factories.	Maine, Massachusetts, New Hampshire, Rhode Island	38, 402	16, 135	25, 571	.54	63.1
40	Planing-mill products not made in planing mills connected with sawmills.	All New England	30, 772	15, 666	260, 190	.53	[illegible].0
41	Wire drawn from purchased bars or rods	Connecticut, Massachusetts	30, 172	15, 280	62, 617	.51	24.4
42	Patent and proprietary medicines and compounds	Maine, Masssachusetts, Vermont	22, 241	15, 003	193, 602	.50	7.7
43	Clocks, time-recording devices, and movements	Connecticut, Massachusetts	18, 345	13, 754	28, 133	.46	48.9
44	Ship and boat building, including repair work	Connecticut, Maine, Massachusetts, Rhode Island	20, 407	13, 311	132, 501	.45	10.0
45	Ice cream	All New England	27, 400	13, 012	151, 043	.44	8.6
46	Car and general construction and repairs, steam-railroad repair shops.	Maine, Massachusetts, Vermont	26, 899	12, 494	690, 120	.42	1.8
47	Carpets and rugs, wool, other than rag	Massachusetts	22, 680	12, 042	81, 287	.40	14.8
48	Beverages	All New England	19, 444	11, 932	147, 264	.40	8.1
49	Firearms	Connecticut, Massachusetts	14, 409	10, 722	14, 405	.36	74.4
50	Motor vehicles, bodies, and parts	Connecticut, Massachusetts, Rhode Island	22, 118	10, 612	510, 120	.36	2.1
51	Corsets and allied garments	Connecticut, Massachusetts	19, 252	10, 536	41, 824	.35	25.2
52	Boot and shoe cut stock not made in shoe factories	Massachusetts	50, 648	10, 390	23, 056	.35	45.1
53	Paper goods, n. e. c	Connecticut, Massachusetts, Rhode Island, Vermont	23, 155	9, 093	62, 151	.31	14.6
54	Toys, games, and playground equipment	Connecticut, Maine, Massachusetts, New Hampshire, Vermont.	13, 893	8, 886	38, 150	.30	23.3
55	Slaughtering and meat packing, wholesale	Maine, Massachusetts, Rhode Island	65, 582	8, 674	393, 475	.29	2.2
56	Structural and ornamental iron and steel work not made in rolling mills.	Connecticut, Massachusetts, Rhode Island	15, 679	8, 560	196, 930	.29	4.4
57	Stationery goods, n. e. c	Connecticut, Massachusetts	16, 122	8, 435	29, 971	.28	28.1
58	Emery wheels and other abrasives and polishing appliances.	do	14, 124	8, 245	13, 342	.28	61.8
59	Petroleum refining	Massachusetts	40, 291	8, 106	389, 651	.27	2.1
60	Paints and varnishes	Connecticut, Massachusetts	16, 860	7, 874	211, 285	.26	3.7
61	Boxes, wood, except cigar boxes	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island.	18, 501	7, 867	58, 195	.26	13.2
62	Fancy and miscellaneous articles, n. e. c	Connecticut, Maine, Massachusetts, Rhode Island	14, 273	7, 848	48, 333	.26	1[illegible].2
63	Cordage and twine	Connecticut, Massachusetts, Rhode Island	20, 546	7, 648	33, 067	.26	[illegible].1
64	Stoves and warm-air furnaces, other than gas, oil, electric	Maine, Massachusetts	10, 481	7, 515	165, 190	.25	4.6
65	Stamped and enameled ware, n. e. c	Connecticut, Massachusetts, Rhode Island	12, 080	7, 357	76, 212	.25	9.7
66	Chemicals, n. e. c	Massachusetts, Rhode Island	14, 633	7, 059	263, 741	.24	2.7
67	Wirework, n. e. c	Connecticut, Massachusetts, Rhode Island	12, 210	6, 976	65, 443	.23	10.7
68	Wood, turned and carved	All New England	11, 642	6, 867	23, 834	.23	28.8
69	Bookbinding and blank-book making	Connecticut, Maine, Massachusetts	9, 455	6, 847	61, 452	.23	11.1
70	Pumps, hand and power, and pumping equipment	Massachusetts	12, 609	6, 760	77, 826	.23	8.7
71	Needles, pins, hooks and eyes, and snap fasteners	Connecticut, New Hampshire	9, 124	6, 678	14, 402	.22	46.4
72	Forgings, iron and steel, not made in steel works or rolling mills.	Connecticut, Massachusetts	11, 359	6, 415	52, 037	.22	12.3

[1] Industries whose totals in individual States can not be shown without disclosing operations of individual establishments are excluded from this table.

RANK OF 108 LEADING INDUSTRIES OF NEW ENGLAND ACCORDING TO VALUE ADDED BY MANUFACTURE IN 1927—Continued

	Industry	States included	Value of products in New England (thousands of dollars)	Value added by manufacture			
				New England (thousands of dollars)	United States (thousands of dol.ars)	Per cent of all New England industries	Per cent of United States total for named industry
73	House furnishings, n. e. c.	Connecticut, Massachusetts, Rhode Island	15, 905	6, 306	34, 972	.21	18.0
74	Envelopes	Massachusetts	13, 876	6, 007	27, 033	.20	22.2
75	Sewing machines, cases, and attachments	Connecticut, Massachusetts	7, 144	5, 695	28, 440	.19	20.0
76	Cigars and cigarettes	Connecticut, Maine, Massachusetts	9, 651	5, 529	630, 168	.19	.9
77	Shirts	Connecticut, Maine, Massachusetts, Vermont	11, 461	5, 512	111, 906	.18	4.9
78	Copper, tin, and sheet-iron ware, including galvanized-iron work, n. e. c.	Connecticut, Maine, Massachusetts, Rhode Island, Vermont.	8, 887	5, 491	92, 743	.18	5.9
79	Engines, turbines, and water wheels	Connecticut, Massachusetts	8, 121	5, 367	202, 676	.18	2.7
80	Furnishing goods, men's n. e. c.	do	11, 448	5, 271	62, 635	.18	8.4
81	Coffee and spice roasting and grinding	Connecticut, Maine, Massachusetts	19, 273	5, 259	99, 629	.18	5.3
82	Bolts, nuts, washers, rivets, iron and steel, not made in rolling mills.	Connecticut, Massachusetts, Rhode Island	8, 511	5, 121	37, 574	.17	13.6
83	Food preparations, n. e. c.	Connecticut, Massachusetts	9, 220	5, 033	68, 716	.17	7.3
84	Clay products, other than pottery, and nonclay refractories.	Connecticut, Maine, Massachusetts, New Hampshire	6, 915	5, 020	220, 038	.17	2.3
85	Millinery and lace goods, n. e. c.	Connecticut, Massachusetts, Rhode Island	8, 761	4, 799	121, 911	.16	3.9
86	Canning and preserving, fish, crabs, shrimp, oysters, and clams.	Maine, Massachusetts	13, 103	4, 686	22, 191	.16	21.1
87	Brushes, other than rubber	Massachusetts, Rhode Island	7, 845	4, 675	25, 291	.16	18.5
88	Plumbers' supplies, not including pipe or vitreous china sanitary ware.	Connecticut, Massachusetts	8, 553	4, 625	93, 246	.16	5.0
89	Silversmithing and silverware	Massachusetts	7, 131	4, 524	19, 539	.15	23.2
90	Sporting and athletic goods, not including firearms and ammunition.	Maine, Massachusetts	8, 425	4, 349	25, 549	.15	17.0
91	Roofing materials, not including wood, slate, burnt tile, asbestos, or metal, other than metal shingles and ceilings.	Massachusetts	9, 515	4, 258	55, 883	.14	7.6
92	Canning and preserving, fruits and vegetables	Maine, Massachusetts, Vermont	12, 382	4, 229	217, 160	.14	2.0
93	Gas and electric-light fixtures	Connecticut, Massachusetts	7, 439	4, 184	72, 194	.14	5.8
94	Concrete products	Connecticut, Maine, Massachusetts, Rhode Island	5, 945	4, 065	59, 346	.14	6.9
95	Photo-engraving, not done in printing establishments	Connecticut, Maine, Massachusetts	4, 659	4, 043	58, 417	.14	6.9
96	Motor cycles, bicycles and parts	Massachusetts	7, 598	4, 019	11, 280	.13	35.6
97	Felt goods, wool or hair	Connecticut, Massachusetts	10, 653	3, 974	18, 606	.13	21.4
98	Musical instruments: Pianos	Massachusetts	6, 614	3, 914	41, 592	.13	9.4
99	Paving materials other than brick or granite	Connecticut, Massachusetts	4, 858	3, 633	65, 242	.12	5.6
100	Musical instruments: Piano or organ materials	do	6, 164	3, 493	12, 587	.12	27.8
101	Mattresses and bed springs, n. e. c.	Connecticut, Maine, Massachusetts, Rhode Island	7, 412	3, 406	46, 652	.11	7.3
102	Lithographing	Massachusetts	5, 048	3, 295	64, 346	.11	5.1

103	Fertilizers	Connecticut, Maine, Massachusetts	8, 520	3, 284	52, 242	.11	6. 3
104	Carriages and sleds, children's	Massachusetts	6, 126	3, 283	14, 773	.11	22. 2
105	Engraving, steel and copper-plate, and plate printing	Connecticut, Massachusetts, Rhode Island	4, 853	3, 258	28, 835	.11	11. 3
106	Screw-machine products	Connecticut, Massachusetts	5, 999	3, 271	27, 243	.11	12. 0
107	Chocolate and cocoa products, not including confectionery.	Massachusetts	18, 958	3, 230	32, 300	.11	10. 0
108	Car and general construction and repairs, electric-railroad repair shops.	Connecticut, Maine, Massachusetts	5, 111	3, 190	54, 083	.11	5. 9
	Total		6, 028, 475	2, 979, 612	20, 235, 727	86. 06	14. 7

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

CONTRIBUTION OF INDIVIDUAL INDUSTRIES TO NATION'S TOTAL

The importance of New England's manufactures to the rest of the country is strikingly indicated by the large number of lines in which the section contributes an outstanding proportion of the Nation's total manufactures. In each of 59 principal lines of industry New England contributed in 1927 over $8,000,000 to the national income, as shown by the value added by manufacture. In this number there were 42 lines in which the New England contribution was upward of 10 per cent of the Nation's total; in 24 of these the contribution from New England exceeded 25 per cent; and in 9 the region contributed more than one-half of the total national income. These lines are shown in the three sections of the following list, with their rank in New England and the percentage relation which New England bears to the United States.

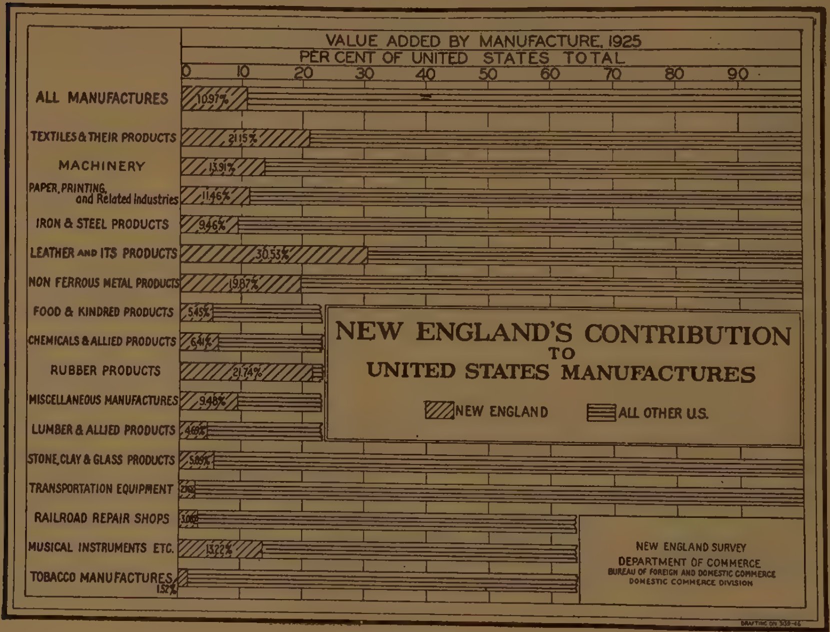

Figure 21

New England's contribution in 1925 to the national income in each of the 16 classifications of manufactures made by the Bureau of the Census is shown in Figure 21.

The articles in which New England contributed upward of half the Nation's total (Group A) include such lines of outstanding importance as woolen goods, worsted goods, textile machinery, and rubber boots and shoes, each of these exceeding 60 per cent of the total for the whole country. In cutlery, edge tools, and plated ware the New England portion exceeded 50 per cent; firearms were at the top of the list, with 74 per cent, and a number of others exceeded 50 per cent. In all these articles the importance of New England manufacture is clearly evident.

Besides these most prominent lines there were within the 60 leading New England manufactures 15 other products which contributed from one-fourth to one-half of the manufacturing income for the whole country. This group includes a number of the leading manufactures of the whole country, among which are cotton goods, boots and shoes other than rubber, paper, hardware, jewelry, brass and bronze products, tools, and several other important lines. There are a number of other products of lesser local importance in which this section contributed upward of 25 per cent. These include, among others, clocks, rubber boots and shoes, boot and shoe cut stock not made in shoe factories, typewriters and supplies, hats of fur felt, dyeing and finishing textiles, stationery goods not elsewhere classified, corsets and allied garments. The New England income from the manufacture of needles and pins was slightly less than half that of the entire country from this source. The full list of items contributing from one-fourth to one-half of the United States total is given in the second part as Group B.

The list of lines in which New England contributed from 10 to 25 per cent of the total national income from their manufacture is a large one. It is presented as Group C in the following classification. Outstanding in this list are electrical machinery, foundry and machine-shop products, rubber goods, silk manufactures, leather manufactures, metal-working machinery, and confectionery.

Group A.—New England Manufactures Contributing Over One-Half of The United States Total

Each exceeding $8,000,000 in value added, 1927

Industry and rank in New England:	Per cent of United States
49. Firearms	74.4
5. Worsted goods	68.9
29. Cotton small wares	64.7
7. Woolen goods	63.2
39. Boot and shoe findings, not made in boot and shoe factories	63.1
14. Textile machinery and parts	62.3
58. Emery wheels and other abrasive and polishing appliances	61.8
20. Cutlery and edge tools, not including silver and plate	58.7
33. Plated ware	51.7

Group B.—New England Manufactures Contributing From One-Fourth to One-Half of the United States Total

Each exceeding $8,000,000 in value added, 1927

Industry and rank in New England:	Per cent of United States
43. Clocks, time-recording devices and movements	48.9
18. Boots and shoes, rubber	46.1
52. Boot and shoe cut stock not made in shoe factories	45.1
30. Typewriters and supplies	39.4
21. Jewelry	38.0
35. Hats, fur-felt	37.8
1. Cotton goods	36.9
15. Hardware, n. e. c	35.9
2. Boots and shoes, other than rubber	34.3
9. Dyeing and finishing textiles	33.5
10. Brass, bronze, and other nonferrous alloys, and copper	31.6
26. Tools, not including edge tools, machine tools, files, or saws	28.9
57. Stationery goods, n. e. c	28.1
6. Paper	26.8
51. Corsets and allied garments	25.2

Each between $3,000,000 and $8,000,000 in value added, 1927

Industry and rank in New England—Continued	Per cent of United States
71. Needles, pins, hooks and eyes, and snap fasteners	46.4
96. Motor cycles, bicycles, and parts	35.6
68. Wood, turning and carving	28.8
100. Musical instruments, piano and organ materials	27.8

GROUP C.—NEW ENGLAND MANUFACTURES CONTRIBUTING FROM 10 PER CENT TO 25 PER CENT OF THE UNITED STATES TOTAL

Each exceeding $8,000,000 in value added, 1927

Industry and rank in New England:	Per cent of United States
41. Wire drawn from purchased bars or rods	24.4
38. Pulp (wood and other fibers)	24.3
54. Toys, games, and playground equipment	23.3
23. Metal-working machinery, including machine tools	20.9
25. Granite, marble and slate, and stonework	20.1
22. Leather, tanned, curried, and finished	18.9
32. Soap	16.9
16. Silk manufactures	16.0
47. Carpets and rugs, wool, other than rag	14.8
3. Electrical machinery and supplies	14.6
53. Paper goods, n. e. c	14.6
27. Confectionery	13.2
36. Boxes, paper and other, n. e. c	12.8
34. Steam-fitting and steam and hot-water heating appliances	12.6
17. Gas, manufactured, illuminating and heating	12.4
11. Rubber goods, tires, and inner tubes	12.3
4. Foundry and machine-shop products, n. e. c	10.3
44. Ship and boat building, including repair work	10.0

Each between $3,000,000 and $8,000,000 in value added, 1927

Industry and rank in New England:	Per cent of United States
89. Silversmithing and silverware	23.2
63. Cordage and twine	23.1
74. Envelopes	22.2
104. Carriages and sleds, children's	22.2
97. Felt goods, wool or hair	21.4
86. Canning and preserving, fish, crab, shrimp, oysters, and clams	21.1
75. Sewing machines, cases, and attachments	20.0
87. Brushes, other than rubber	18.5
73. Housefurnishings, n. e. c	18.0
90. Sporting and athletic goods, not including firearms and ammunition	17.0
62. Fancy miscellaneous articles, n. e. c	16.2
82. Bolts, nuts, rivets, iron and steel, not made in rolling mills	13.6
61. Boxes, wood, except cigar boxes	13.2
72. Forgings, iron and steel, not made in steel works or rolling mills	12.3
106. Screw-machine products	12.0
105. Engraving, steel and copper plate, and plate printing	11.3
69. Bookbinding and blank-book making	11.1
67. Wire work, n. e. c	10.7
107. Chocolate and cocoa products, not including confectionery	10.0

CHANGES IN NEW ENGLAND MANUFACTURE

This discussion presents the changes that have taken place from 1849 to 1927 in the total income from New England manufactures. Its purpose is to show the growth of New England manufacturing as a whole at different periods and to indicate how this growth compares with national development and with the growth of manufacturing in other parts of the United States. No attempt has been made to adjust the figures for changes in the value of the dollar at different periods. These variations should be taken into account in making comparisons of changes in the income from manufacturing at different times. Comparisons in this discussion deal with identical time intervals, and hence no adjustment for changes in dollar value is attempted. Tables are presented showing (1) New England's proportion of the national population and manufacturing in each census year since 1849; (2) the change in total New England manufactures during each intercensal period, compared with the United States; (3) the periods of pronounced contrast and of slight contrast in the growth of manufacturing in New England and in the whole country; (4) the growth of manufacturing in different geographical divisions from 1904 to 1914 and from 1914 to 1925; (5) changes in total manufacturing of New England in these periods, compared with those for the whole United States; (6) changes in each of the 24 leading New England industries in these two periods.

In the year of the first national census of manufactures, that of 1849, over one-fourth of the national income from manufacturing was contributed by New England. At that time the borders of the six New England States included somewhat less than one-eighth of the total population of the country. Since the middle of the nineteenth century there has been a continuous and fairly regular recession in the relative position of this region, due to the increase of population in other parts of the United States, and to the expansion of manufactures accompanying the growth in population. The income from New England manufactures in 1927 comprised approximately 11 per cent of the national total, and the population of New England was somewhat less than 7 per cent of the total.

New England's share in the national population and manufacturing in each year for which official figures are available, from 1849 to 1927, inclusive, is shown in the following table.

NEW ENGLAND'S PORTION OF THE NATION'S POPULATION AND MANUFACTURES, CENSUS YEARS, 1849 TO 1927

Census year	New England percentage of United States population	New England percentage of United States manufactures (value added)	Census year	New England percentage of United States population	New England percentage of United States manufactures (value added)
1927	[1] 6.90	10.80	1904	(2)	14.45
1925	[1] 6.92	10.96	1899	7.36	15.49
1923	[1] 6.96	12.12	1889	7.47	16.78
1921	[1] 6.98	13.00	1879	8.00	22.60
1919	7.00	12.90	1869	9.05	23.18
1914	(2)	12.85	1859	9.97	26.11
1909	7.12	14.00	1849	11.76	28.07

[1] Estimated.

[2] No figures.

The income from New England manufacturing, in terms of the actual dollars of value added by the manufacturing processes, shows a continuous advance in each census year, from the date of the first census of manufacturing, in 1849, up to the close of the World War period in 1919. Throughout these 70 years the total figures for the last year in each census period were in every instance greater than the figures for the end of the preceding census period.

The most notable early periods of expansion were the two 10-year periods preceding 1869 and the decade ending in 1889. Previous to the World War the 10 years of greatest growth of New England manufactures were those comprising the period from 1859 to 1869. The New England income from manufacturing was then increased by 81 per cent. It is obvious that this increase was due, in part, to the inflated dollar values following the Civil War period. Outside of this abnormal period the greatest increases in New England manufacturing took place in the decade ended in 1859, which showed an expansion of 71 per cent; in the period ended in 1889, with 58 per cent increase; and the 10 years preceding 1909, which also showed an increase of 58 per cent. In contrast to these periods of conspicuous growth, the decade ended in 1899 showed an increase of only 7 per cent in its manufacturing income. In the five years from 1909 to 1914 also, the expansion was only 6 per cent.

In adjacent columns of the following table are given the total value added by all manufacturing in New England and in the United States. In the last two columns of the table the figure for each census year is shown as a percentage of the figure for the preceding census. The percentage change in the different census periods is readily ascertained by observing the difference between the percentages and 100 per cent. The years where these percentages are over 100 indicate an increase over the preceding census year; while the years in which the given percentage figures are below 100 are those in which there was a decline from the preceding census.

NEW ENGLAND COMPARED WITH ENTIRE UNITED STATES IN TOTAL MANUFACTURES, CENSUS YEARS, 1849 TO 1927

Census year	Value added by all manufactures			
	Millions of dollars		Percentage of preceding census figures	
	New England	United States	New England	United States
1927	2,980	27,585	101.5	100.3
1925[1]	2,936	26,778	94.0	103.9
1923[1]	3,125	25,778	131.5	141.1
1921[1]	2,376	18,272	73.5	73.0
1919	3,231	25,042	254.6	253.5
1914	1,269	9,878	106.3	115.8
1909	1,194	8,529	131.2	135.5
1904	910	6,294	120.4	130.3
1899	756	4,831	107.1	114.8
1889	706	4,210	158.3	213.4
1879	446	1,973	110.4	113.1
1869	404	1,744	181.2	204.2
1859	223	854	171.5	184.1
1849	130	464	--------	--------

[1] No data for "Coffee and spice, roasting and grinding" and "Automobile repairing" are included in the statistics here given for the years 1925, 1923, and 1921. The statistics given for the years from 1849 to 1919, inclusive, contain figures for these two industries.

The time of greatest expansion of New England manufactures, as shown by the actual dollar value added, was the 5-year period from 1914 to 1919, in which the value added by New England manufactures increased over one and one-half times. This abnormal expansion was followed, in the 6-year period from 1919 to 1925, by a net reduction amounting to 9 per cent of the 1919 income from New England manufacturing.

The postwar deflation period, from 1919 to 1921, brought about a drop of over 26 per cent of the 1919 total. In the succeeding 2-year period, from 1921 to 1923, there was a substantial increase in the income from New England manufacturing, the advance comprising over 31 per cent of the 1921 figure. This, in turn, was followed in the two years from 1923 to 1925 by a drop of 6 per cent from the 1923 figure.

Contrasts between the changes in New England industry and the changes which took place throughout the country as a whole in the different intercensal periods may be located by comparing their respective positions in the census years. The census figures show that in every interval up to 1914 the growth of manufacturing in New England was exceeded by the growth of manufacturing in the Nation as a whole. In other words, the industrial development of New England was so largely completed in the earlier years of the country's history that ever since the middle of the last century manufacturing has expanded in other parts of the country more rapidly than it has in New England. In the early days when new sections of the country were being opened up to settlement and development the energies and capital of the people were so fully absorbed by their immediate tasks that little effort was available for the development of manufactures. New England, on the other hand, had already established manufacturing as its dominant activity, with highly developed commerce and much accumulated capital. Its limited natural resources had favored the early growth and maturity of its manufactures.

Throughout the different census intervals the prevailing condition has been one of substantially greater increase in manufacturing income for the country as a whole than for New England alone. In the 12 intercensal periods from 1849 to 1925 there were 7 intervals in which the national increase exceeded the increase in New England to a very considerable degree, while there were 6 intervals in which there was only slight contrast.

The single period of most pronounced contrast was the 10-year interval from 1879 to 1889. In this period there was much wider difference between New England and the country as a whole than that for the postwar interval from 1921 to 1927. Considering the latter interval, the total 1927 income from manufacturing was 125 per cent of the 1921 total for New England, while for the country as a whole the 1927 figures were 151 per cent of the total for 1921. Even when the difference in length of periods is taken into account, there was less contrast between New England and the entire United States in the growth of manufactures during the postwar period from 1921 to 1927 than there was in the decade from 1879 to 1889.

In the 9-year period from 1914 to 1923 covering the World War and the early postwar years, there was very slight contrast between New England and the entire country. The manufacturing income in New England showed a slightly greater increase from 1914 to 1919 than was shown by the country as a whole; and in the deflation period from 1919 to 1921 the falling off of manufacturing income in New England was slightly less than the reduction for the country as a whole.

The periods of contrast between New England and the entire United States in their respective changes in total manufacturing income are shown in the following table in two pairs of columns. The first pair shows the census intervals when there was substantial contrast between New England and the United States, while the second pair shows the periods of slight contrast.

PERIODS OF CONTRAST BETWEEN NEW ENGLAND AND THE ENTIRE UNITED STATES

[Total value added by manufacture in later year of each census interval expressed as percentage of preceding census year]

Census interval	Substantial contrast		Slight contrast		Census interval	Substantial contrast		Slight contrast	
	New England	Entire United States	New England	Entire United States		New England	Entire United States	New England	Entire United States
	Per cent	*Per cent*	*Per cent*	*Per cent*		*Per cent*	*Per cent*	*Per cent*	*Per cent*
1925–1927			101.5	103.0	1899–1904	120.4	130.3		
1923–1925	94.0	103.9			1889–1899			107.1	114.8
1921–1923	131.5	141.1			1879–1889	158.3	213.4		
1919–1921			73.5	73.0	1869–1879			110.4	113.1
1914–1919			254.6	253.5	1859–1869	181.2	204.2		
1909–1914	106.3	115.8			1849–1859	171.5	184.1		
1904–1909			131.2	135.5					

COMPARISON WITH OTHER SECTIONS

Throughout the period from 1849 to 1925 the manufactures of New England were surpassed continuously by the three Middle Atlantic States of New York, New Jersey, and Pennsylvania. The Middle Atlantic section during that period continued to be the leading manufacturing region of the country. From 1849 to 1889 New England's share of the Nation's total income from manufacturing fell from 28 per cent to less than 17 per cent. In this interval the Middle Atlantic division also fell back from 40 per cent of the Nation's total to 37 per cent. By 1925 it had fallen to 33 per cent.

The development of manufacturing in the Middle West was such that by 1889 New England had been passed by the five States of the East North Central division (Ohio, Indiana, Illinois, Michigan, and Wisconsin). These States then contributed 24 per cent of the Nation's total, in contrast to only 11 per cent in 1849. By 1925 the advance of manufacturing in the East North Central division of States was such that they then contributed 31 per cent of the Nation's total and were approaching closely the Middle Atlantic States, whose contribution had receded to 33 per cent. Relative advances were made also by the States in the South Atlantic division (Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, and Florida); by the West North Central States (Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas); and by the West South Central States (Arkansas, Louisiana, Oklahoma, and Texas).

In 1849, 93 per cent of the Nation's manufacturing was located in States east of the Mississippi River, and only 7 per cent west of this dividing line. By 1889 the proportion of the Nation's manufacturing east of the Mississippi River was reduced to 87 per cent, and 13 per cent was in the other States. In 1925, 85 per cent of the Nation's manufacturing was located in the 26 States east of the Mississippi River, and 15 per cent was in the 22 States west of this dividing line.

PRE-WAR AND POST-WAR CHANGES IN VALUE ADDED BY MANUFACTURE IN THE ENTIRE UNITED STATES AND IN THE FOUR PRINCIPAL GROUPS OF MANUFACTURING STATES

Geographic division	Percentage increase	
	10-year period 1904–1914	11-year period 1914–1925
Entire United States	57.0	176.8
New England	39.5	131.4
Middle Atlantic	49.4	158.5
East North Central	76.1	200.7
South Atlantic	60.4	191.6

PRE-WAR AND POST-WAR PERIODS COMPARED

It is instructive to compare the changes in New England manufacturing during the abnormal 11-year period from 1914 to 1925 with the 10-year period from 1904 to 1914, which was a time of fairly stable industrial conditions. During the earlier period the income from New England manufactures increased by 39.5 per cent of its amount in 1904. There was an increase of 21 per cent in the number of wage earners. Wages increased 43 per cent, considerably more than the increase in total manufacturing income. The cost of materials increased by nearly one-half, considerably more than the increase in wages. The gross value of the total output increased 44 per cent, and there was an increase of invested capital of nearly 58 per cent.

In the 11-year period from 1914 to 1925 there was an increase in wages of 113 per cent, but a slight falling off in the average number of wage earners employed. The cost of materials was not quite doubled, and the gross value of the output was more than doubled. The total net income from manufacturing, as shown in the value added by manufacture, showed a considerably greater rate of increase than did the gross value of manufactured products.

CHANGES FROM 1904 TO 1914 AND FROM 1914 TO 1925 IN FACTORS OF MANUFACTURING ACTIVITY IN NEW ENGLAND AS COMPARED WITH THE ENTIRE UNITED STATES

Item	1914 as percentage of 1904		1925 as percentage of 1914	
	New England	United States	New England	United States
Number of wage earners	121.2	128.7	98.4	121.7
Wages paid	143.1	156.2	213.1	264.1
Cost of materials	148.5	169.0	194.5	253.7
Value of product	144.5	163.9	210.5	263.1
Value added by manufacture	139.5	157.0	231.4	276.8
Capital invested	157.6	167.2	----------	----------

CHANGES IN LEADING INDUSTRIES

When figures of the output of individual industries are analyzed it is found that there are numerous important lines of New England activity whose advance from 1914 to 1925 exceeded that in other sections of the country. In the 24 leading lines of manufacturing there were 7 in which the increase from 1914 to 1925, as shown by the value added by manufacture, was greater in this section than the growth for the country as a whole, including New England. The

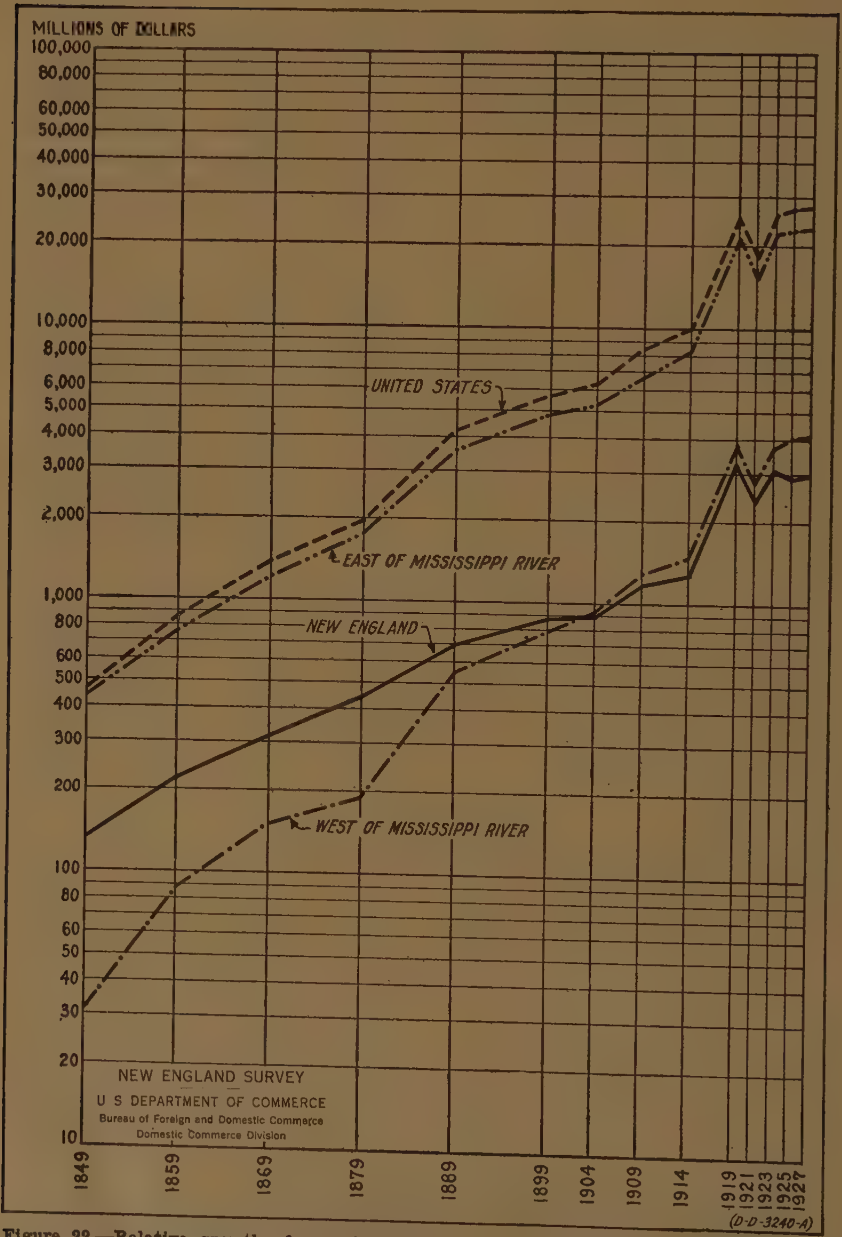

Figure 22.—Relative growth of manufacturing income, as indicated by value added by manufacture, east and west of the Mississippi River

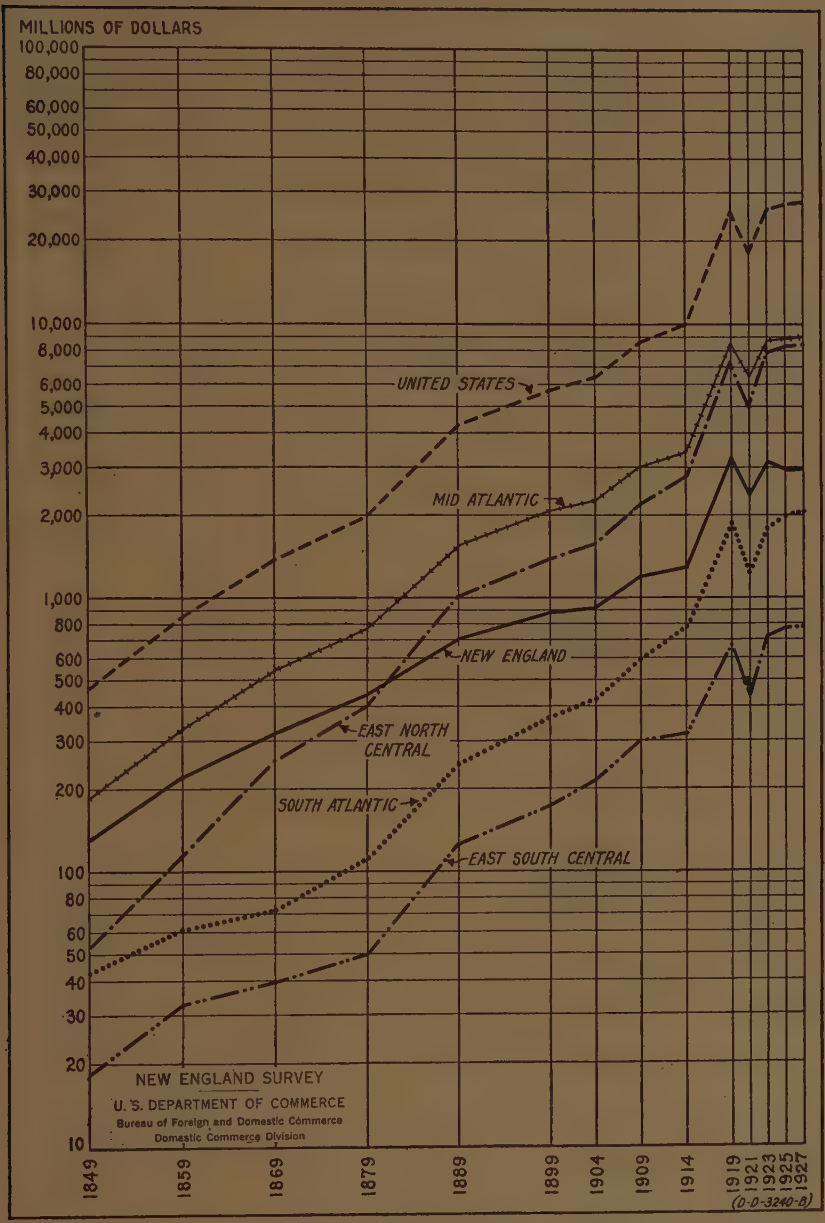

Figure 23.—Relative growth of manufacturing income, as indicated by value added by manufacture, in various geographic regions

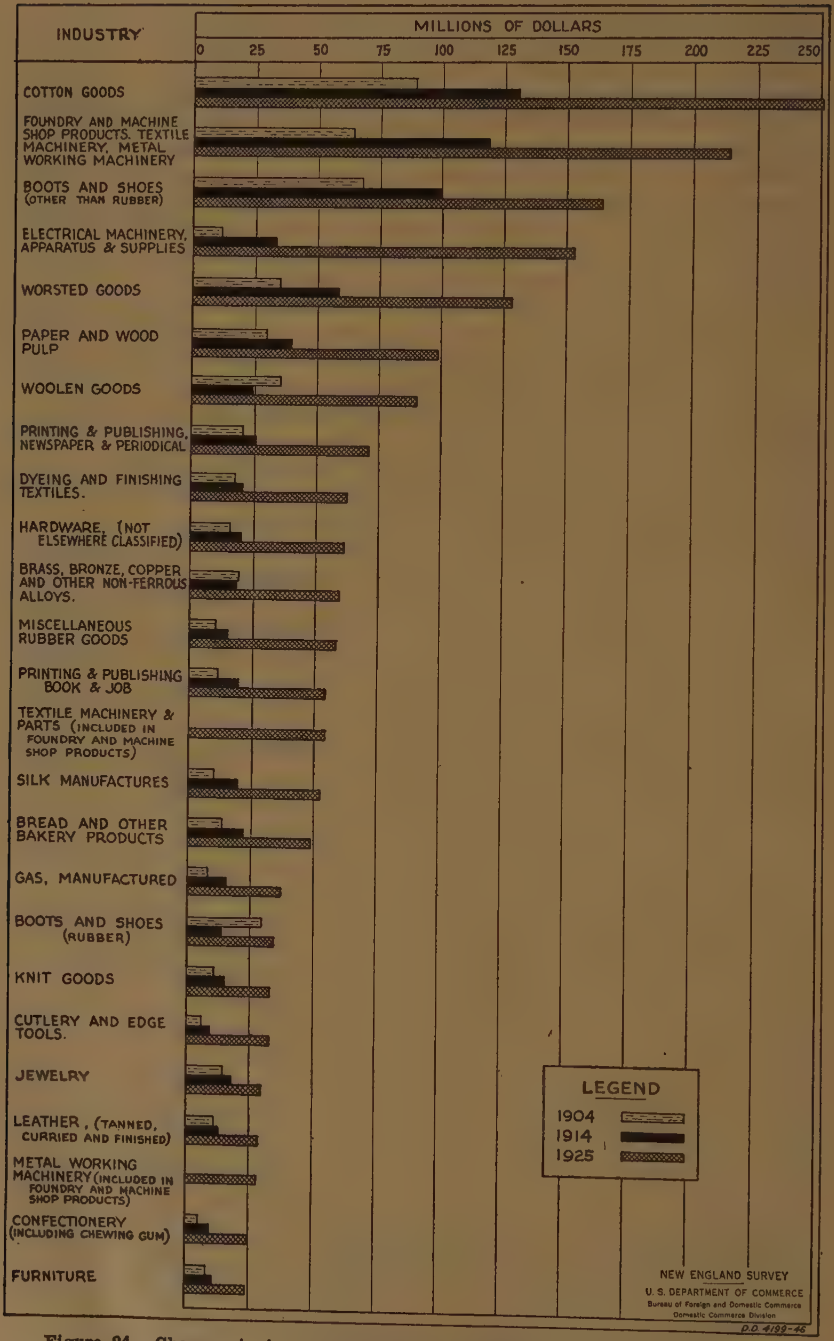

Figure 24.—Changes in income contributed by leading New England industries in 1904, 1914, and 1925

products of which this is true are cutlery and edge tools, the printing and publishing of books and job work, gas manufacture, rubber boots and shoes, worsted goods, woolen goods, and leather.

Besides the products in which the New England advance stands out above that for the rest of the country there are a number of others in which the growth in New England was very substantial, although less than that for the country as a whole. Important lines in which New England shows substantial growth include electrical machinery and equipment; paper and pulp; newspaper and periodical publishing; dyeing and finishing textiles; hardware, brass and bronze products; miscellaneous rubber goods; silk manufactures; and confectionery.

The total value added to the New England income for each of the 24 leading products is shown for 1904, 1914, and 1925 in the next table. The figures for 1914 are shown also as percentages of 1904, and those for 1925 as percentages of 1914. Comparison of the changes in the pre-war period with the change in the period since 1914 may thus be easily made for each of these products. The table includes the corresponding figures for the entire United States, so that changes in New England may be compared with the national changes in each case. The changes in these specific products are discussed in the portions of this report that deal with the respective lines of industry.

CHANGES IN 24 LEADING NEW ENGLAND MANUFACTURES, 1904 TO 1914 AND 1914 TO 1925

Rank in 1925	Product and census year	Value added by manufacture			
		New England	Entire United States	1914 as percentage of 1904 and 1925 as percentage of 1914 [1]	
				New England	Entire United States
1	Cotton goods:				
	1904	$88,169,000	$160,404,000		
	1914	130,175,000	244,967,000	147.6	152.7
	1925	251,015,000	637,215,000	192.8	260.1
2	Boots and shoes, other than rubber:				
	1904	67,500,000	122,744,000		
	1914	100,216,000	191,404,000	148.5	155.9
	1925	165,467,000	443,751,000	161.2	231.8
3	Electrical machinery, apparatus, and supplies:				
	1904	12,224,000	73,972,000		
	1914	34,928,000	180,442,000	285.7	243.9
	1925	153,446,000	903,310,000	439.3	500.6
4	Worsted goods:				
	1904	35,612,000	56,087,000		
	1914	58,570,000	92,868,000	164.5	165.6
	1925	133,122,000	195,483,000	227.3	210.5
5	Foundry and machine-shop products:				
	1904	63,868,000	407,827,000		
	1914	117,574,000	508,423,000	184.1	124.7
	1925	132,938,000	1,349,278,000	113.1	265.4
6	Paper and wood pulp:				
	1904	30,343,000	77,464,000		
	1914	40,368,000	118,966,000	133.0	153.6
	1925	98,817,000	366,022,000	244.8	307.7
7	Woolen goods:				
	1904	35,807,000	54,366,000		
	1914	24,618,000	40,120,000	68.8	73.8
	1925	91,170,000	141,906,000	370.3	353.7

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[1] The accuracy of some of these percentages may be affected slightly by the incompleteness of census data for New England in 1914 and 1904, due to exclusion of certain returns to avoid disclosure of individual operations.

CHANGES IN 24 LEADING NEW ENGLAND MANUFACTURES, 1904 TO 1914 AND 1914 TO 1925—Continued

Rank in 1925	Product and census year	Value added by manufacture			
		New England	Entire United States	1914 as percentage of 1904 and 1925 as percentage of 1914	
				New England	Entire United States
8	Printing and publishing newspapers and periodicals:				
	1904	$20, 962, 000	$238, 970, 000	--------	--------
	1914	26, 114, 000	366, 824, 000	124. 6	153. 5
	1925	71, 765, 000	1, 068, 121, 000	274. 8	291. 2
9	Rubber goods and rubber tires and inner tubes:				
	1904	9, 739, 000	29, 948, 000	--------	--------
	1914	15, 439, 000	108, 093, 000	158. 5	360. 9
	1925	64, 463, 000	461, 205, 000	417. 5	426. 7
10	Hardware, not elsewhere classified:				
	1904	15, 631, 000	32, 130, 000	--------	--------
	1914	21, 035, 000	46, 499, 000	134. 6	144. 7
	1925	62, 781, 000	147, 550, 000	298. 5	317. 3
11	Dyeing and finishing textiles:				
	1904	15, 096, 000	31, 228, 000	--------	--------
	1914	21, 051, 000	52, 586, 000	132. 8	168. 4
	1925	62, 699, 000	187, 837, 000	297. 8	357. 2
12	Brass, bronze, copper, and other nonferrous alloys:				
	1904	18, 450, 000	37, 291, 000	--------	--------
	1914	18, 170, 000	47, 244, 000	98. 5	126. 7
	1925	59, 719, 000	182, 084, 000	328. 7	385. 4
13	Silk manufactures:				
	1904	10, 241, 000	57, 427, 000	--------	--------
	1914	19, 239, 000	109, 569, 000	187. 9	190. 8
	1925	54, 941, 000	324, 857, 000	285. 6	296. 5
14	Printing and publishing, book and job:				
	1904	12, 228, 000	130, 037, 000	--------	--------
	1914	19, 715, 000	210, 878, 000	161. 2	162. 2
	1925	54, 606, 000	578, 198, 000	277. 0	274. 2
15	Textile machinery and parts:				
	1904	(2)	(2)	--------	--------
	1914	(2)	(2)	--------	--------
	1925	53, 747, 000	82, 617, 000	--------	--------
16	Boots and shoes, rubber:				
	1904	30, 378, 000	38, 065, 000	--------	--------
	1914	13, 334, 000	29, 866, 000	43. 9	78. 5
	1925	51, 773, 000	75, 368, 000	388. 3	252. 4
17	Bread and other bakery products:				
	1904	12, 876, 000	113, 610, 000	--------	--------
	1914	22, 426, 000	217, 636, 000	174. 2	191. 6
	1925	48, 775, 000	600, 178, 000	217. 5	275. 8
18	Gas, manufactured:				
	1904	8, 472, 000	87, 965, 000	--------	--------
	1914	15, 863, 000	143, 459, 000	187. 2	163. 1
	1925	36, 992, 000	277, 037, 000	233. 2	193. 1
19	Knit goods:				
	1904	11, 319, 000	59, 964, 000	--------	--------
	1914	15, 162, 000	112, 225, 000	134. 0	187. 2
	1925	33, 149, 000	356, 034, 000	218. 6	317. 2
20	Cutlery and edge tools:				
	1904	6, 114, 000	12, 587, 000	--------	--------
	1914	8, 501, 000	17, 355, 000	139. 0	137. 9
	1925	33, 064, 000	59, 701, 000	389. 0	344. 0
21	Leather, tanned, curried and finished:				
	1904	11, 674, 000	61, 442, 000	--------	--------
	1914	13, 313, 000	82, 956, 000	114. 0	135. 0
	1925	31, 041, 000	155, 380, 000	233. 2	187. 3
22	Jewelry:				
	1904	14, 183, 000	29, 048, 000	--------	--------
	1914	18, 029, 000	41, 890, 000	127. 1	144. 2
	1925	30, 313, 000	86, 931, 000	168. 1	207. 5
23	Metal-working machinery, including machine tools:				
	1904	(2)	(2)	--------	--------
	1914	(2)	(2)	--------	--------
	1925	28, 445, 000	121, 068, 000	--------	--------
24	Confectionery:				
	1904	4, 528, 000	38, 277, 000	--------	--------
	1914	8, 915, 000	69, 830, 000	196. 9	182. 4
	1925	25, 147, 000	203, 519, 000	279. 7	291. 4

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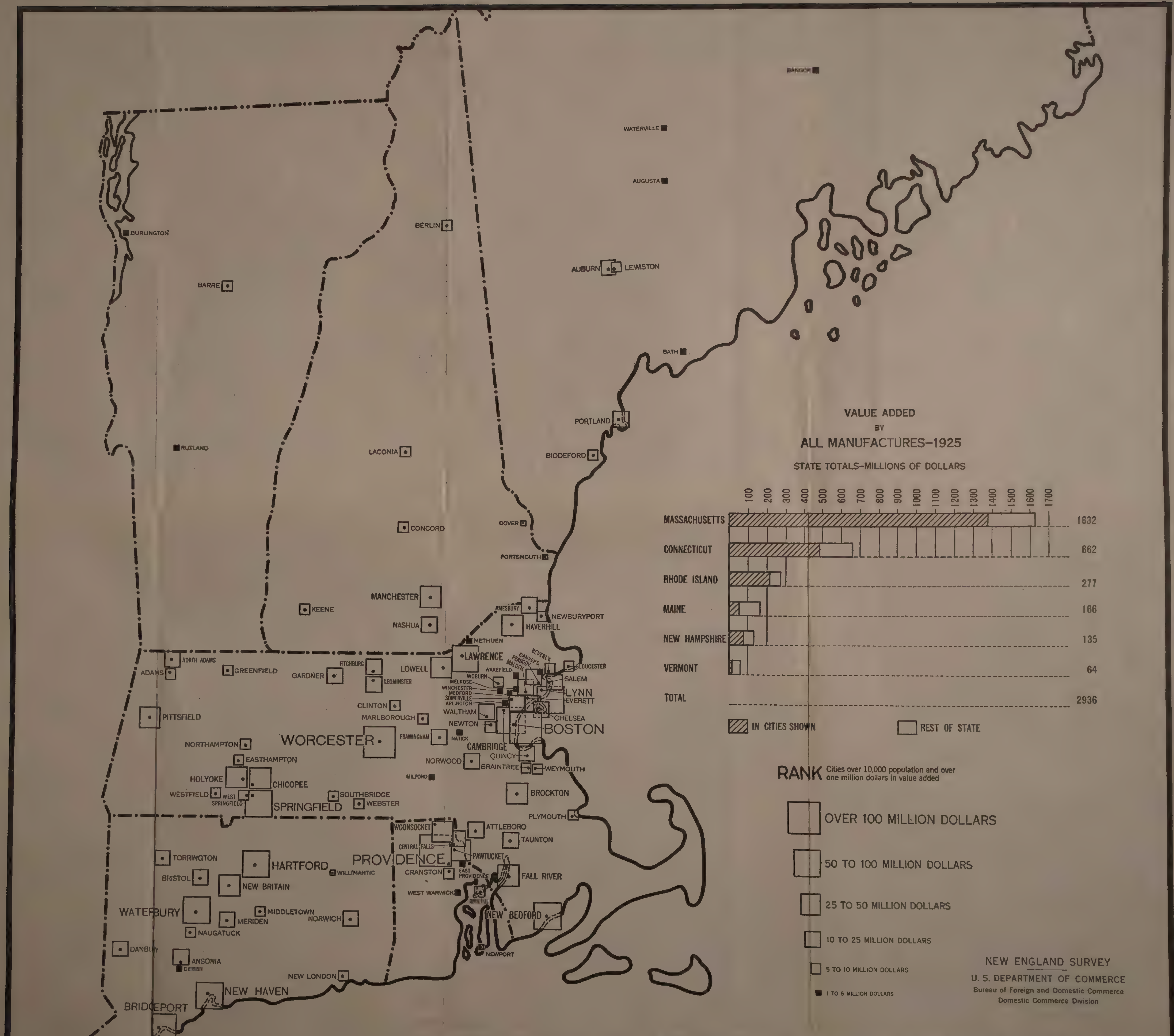
[2] Not segregated


BANGOR
WATERVILLE
AUGUSTA
BERLIN
BURLINGTON
AUBURN
LEWISTON
BARRE
BATH
PORTLAND
RUTLAND
LACONIA
BIDDEFORD
VALUE ADDED
BY
ALL MANUFACTURES—1925
STATE TOTALS—MILLIONS OF DOLLARS
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
MASSACHUSETTS
1632
CONNECTICUT
662
RHODE ISLAND
277
MAINE
166
NEW HAMPSHIRE
135
VERMONT
64
TOTAL
2936
▨ IN CITIES SHOWN
☐ REST OF STATE
CONCORD
DOVER
PORTSMOUTH
MANCHESTER
KEENE
NASHUA
AMESBURY
NEWBURYPORT
HAVERHILL
METHUEN
LAWRENCE
NORTH ADAMS
ADAMS
GREENFIELD
GARDNER
FITCHBURG
LEOMINSTER
LOWELL
BEVERLY
DANVERS
PEABODY
MALDEN
WAKEFIELD
GLOUCESTER
WOBURN
MELROSE
WINCHESTER
MEDFORD
SOMERVILLE
ARLINGTON
SALEM
LYNN
EVERETT
CLINTON
WALTHAM
CHELSEA
PITTSFIELD
MARLBOROUGH
NEWTON
BOSTON
FRAMINGHAM
NATICK
WORCESTER
CAMBRIDGE
NORTHAMPTON
QUINCY
NORWOOD
BRAINTREE
WEYMOUTH
EASTHAMPTON
MILFORD
HOLYOKE
CHICOPEE
WESTFIELD
WEST SPRINGFIELD
SOUTHBRIDGE
WEBSTER
SPRINGFIELD
BROCKTON
RANK
Cities over 10,000 population and over one million dollars in value added
PLYMOUTH
WOONSOCKET
ATTLEBORO
TAUNTON
OVER 100 MILLION DOLLARS
CENTRAL FALLS
TORRINGTON
PROVIDENCE
PAWTUCKET
HARTFORD
WILLIMANTIC
CRANSTON
EAST PROVIDENCE
FALL RIVER
BRISTOL
NEW BRITAIN
50 TO 100 MILLION DOLLARS
WEST WARWICK
WATERBURY
MIDDLETOWN
NORWICH
NEW BEDFORD
MERIDEN
25 TO 50 MILLION DOLLARS
NAUGATUCK
10 TO 25 MILLION DOLLARS
DANBURY
NEWPORT
ANSONIA
DERBY
5 TO 10 MILLION DOLLARS
NEW ENGLAND SURVEY
U. S. DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce
Domestic Commerce Division
NEW LONDON
NEW HAVEN
1 TO 5 MILLION DOLLARS
BRIDGEPORT
STAMFORD
NORWALK

LOCALIZATION OF NEW ENGLAND MANUFACTURING
(IN CITIES OVER 10,000 POPULATION)

D.D. 3140-46

61232°—29. (Face p. 177.)

Figure 25

LOCALIZATION OF NEW ENGLAND MANUFACTURING

The way in which manufacturing activity is distributed within New England is presented here according to three kinds of political subdivisions. It is shown first according to States. In the second part are given the figures for cities and towns. (See Fig. 25.) A special tabulation of the manufacturing establishments in each county, classified according to the type of manufacturing, is given in the third part.

LOCALIZATION BY STATES

The next table shows the magnitude of manufacturing as a whole in the individual States. This is followed by a series of tables, one for each of the six States, showing the rank and importance of the principal industries of the State. This shows at a glance the kinds of manufacturing activity which are dominant in each State and their relative importance, as indicated by the number of establishments, wage earners, wages, cost of materials, value of products, and value added by manufacture, together with the percentage relation (according to value added by manufacture) which each named industry bears to the total for the State. (See figs. 26–32.)

Another table shows the position of each State in each of the 25 leading manufactures of New England. In some cases the figures for two or more States are combined.

New England Industry, by States, All Manufactures, 1927

[All values in thousands: i. e., 000 omitted]

State	Number of establishments	Wage earners	Wages	Materials	Products	Value added by manufacture	
						Amount	Per cent of New England total
Massachusetts	10, 037	578, 068	705, 930	1, 678, 812	3, 317, 852	1, 639, 040	55. 0
Connecticut	2, 877	240, 806	304, 504	596, 014	1, 284, 738	688, 724	23. 1
Rhode Island	1, 497	120, 009	138, 896	313, 107	592, 233	279, 126	9. 4
Maine	1, 426	68, 142	74, 212	208, 866	372, 094	163, 228	5. 5
New Hampshire	1, 028	65, 482	72, 803	182, 106	327, 528	145, 422	4. 9
Vermont	880	26, 241	32, 305	69, 957	134, 030	64, 073	2. 1
Total	17, 745	1, 098, 748	1, 328, 650	3, 048, 862	6, 028, 475	2, 979, 613	100. 0

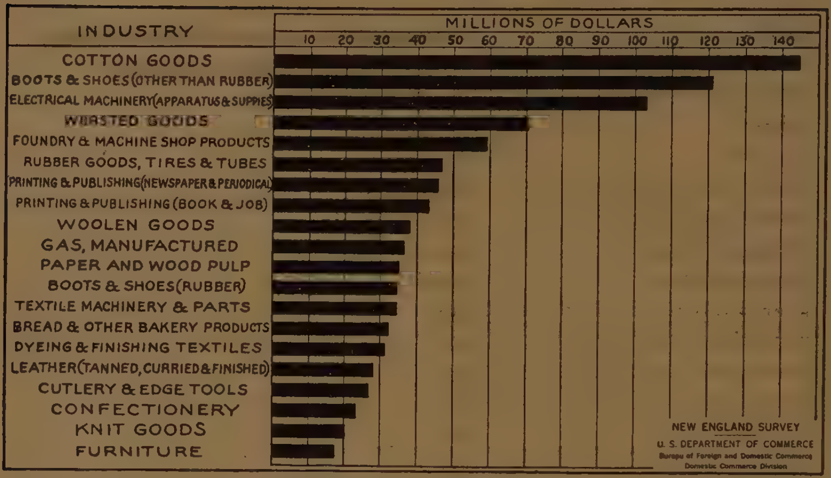


Figure 26.—Rank of 20 leading industries in Massachusetts according to value added by manufacture in 1925

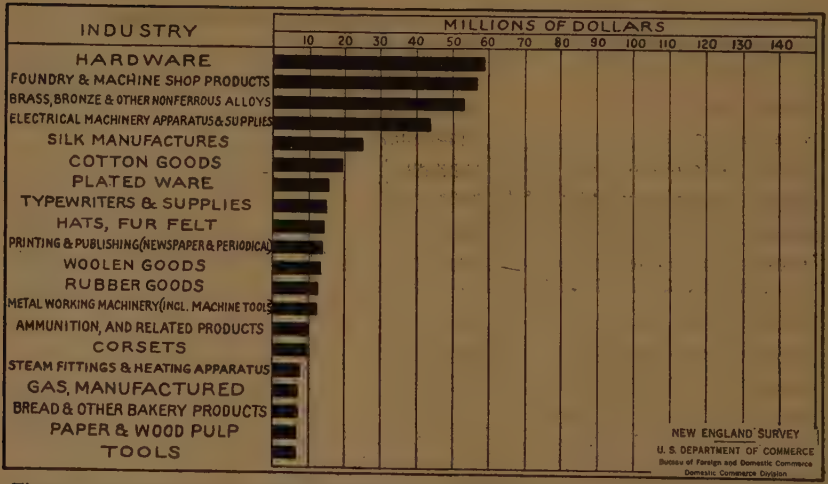


Figure 27.—Rank of 20 leading industries in Connecticut according to value added by manufacture in 1925

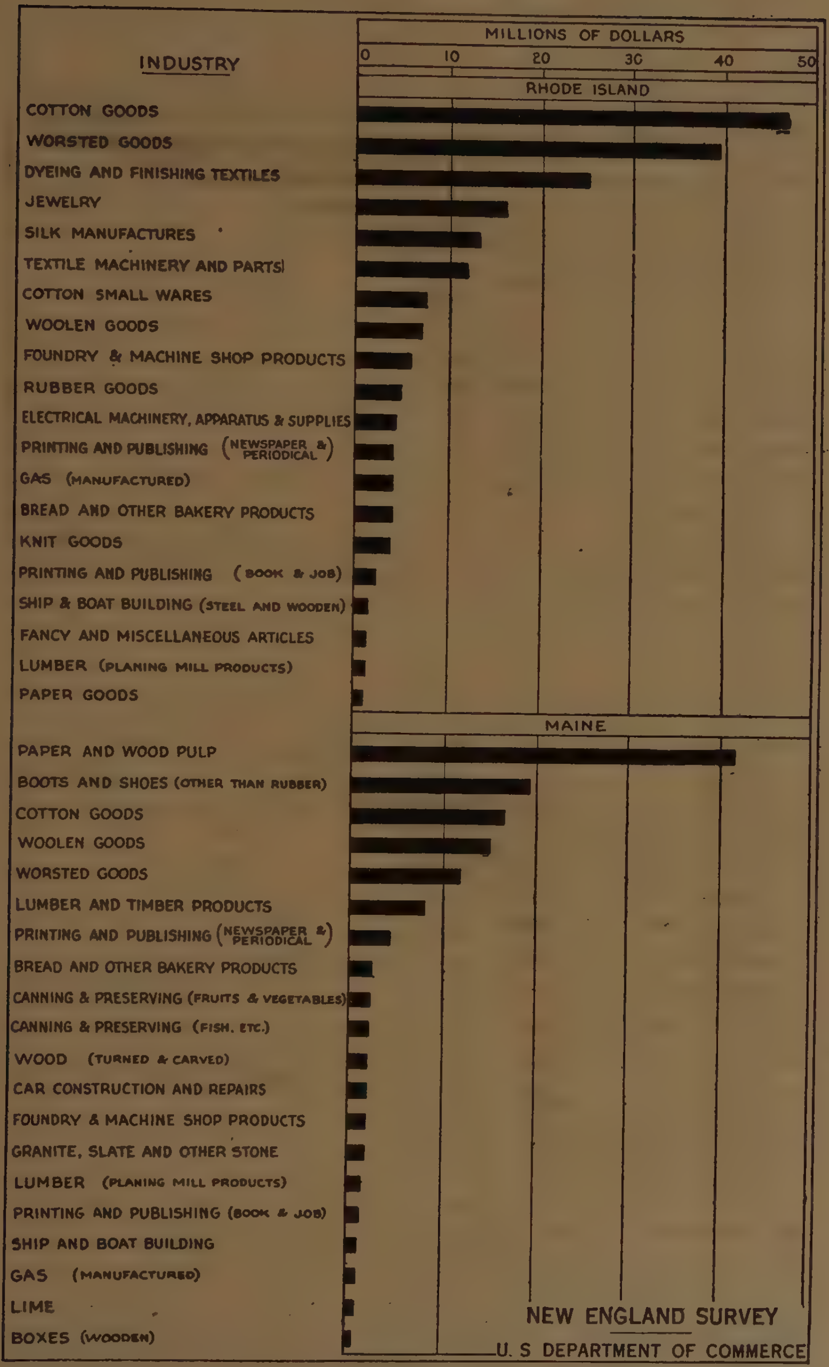


Figure 28.—Rank of 20 leading industries in Rhode Island and in Maine according to value added by manufacture in 1925

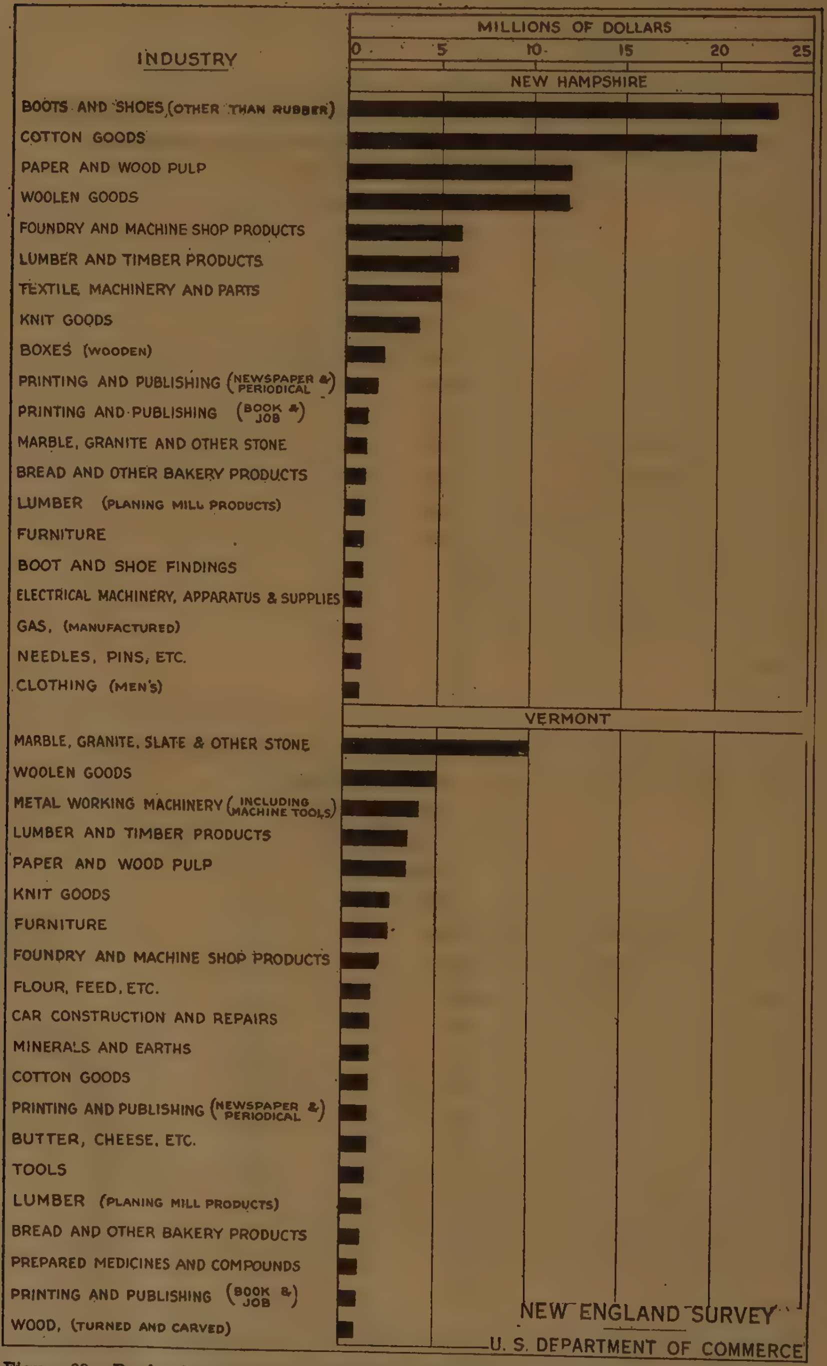


Figure 29.—Rank of 20 leading industries in New Hampshire and in Vermont according to value added by manufacture in 1925

LEADING INDUSTRIES OF MASSACHUSETTS, RANKED ACCORDING TO VALUE ADDED BY MANUFACTURE, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Cotton goods	163	90, 875	88, 090	145, 631	284, 706	139, 075	8. 49
2	Boots and shoes, other than rubber	469	55, 986	65, 282	120, 354	237, 517	117, 163	7. 15
3	Electrical machinery, apparatus, and supplies	122	24, 759	33, 904	42, 198	139, 349	97, 151	5. 93
4	Worsted goods	75	35, 141	38, 667	122, 809	195, 096	72, 287	4. 41
5	Foundry and machine-shop products, n. e. c.	496	19, 898	30, 059	30, 760	94, 149	63, 389	3. 87
6	Printing and publishing, newspaper and periodical	332	5, 664	11, 977	22, 077	72, 314	50, 237	3. 07
7	Printing and publishing, book and job	681	8, 569	13, 294	13, 090	57, 852	44, 762	2. 73
8	Rubber goods (other than rubber boots and shoes) and rubber tires and inner tubes	64	10, 364	13, 298	56, 716	97, 718	41, 002	2. 50
9	Paper	80	12, 127	15, 608	50, 383	91, 095	40, 712	2. 48
10	Boots and shoes, rubber	10	12, 081	15, 471	18, 957	56, 440	37, 483	2. 29
11	Bread and other bakery products	1, 044	8, 473	11, 028	37, 102	73, 706	36, 604	2. 23
12	Woolen goods	99	15, 923	19, 369	40, 341	73, 740	33, 399	2. 04
13	Dyeing and finishing textiles	68	13, 826	16, 229	51, 434	84, 459	33, 025	2. 01
14	Textile machinery and parts	119	12, 009	16, 242	15, 008	46, 866	31, 858	1. 94
15	Leather (tanned, curried, and finished)	115	10, 768	14, 588	47, 861	77, 649	29, 788	1. 82
16	Cutlery (not including silver and plated cutlery) and edge tools	42	3, 407	4, 174	5, 883	33, 705	27, 822	1. 70
17	Gas, manufactured, illuminating and heating	41	4, 079	6, 047	16, 202	38, 658	22, 456	1. 37
18	Knit goods	93	9, 660	9, 339	22, 316	43, 937	21, 621	1. 32
19	Confectionery	148	8, 373	7, 244	28, 308	49, 674	21, 366	1. 30
20	Furniture, including store and office fixtures	194	8, 077	11, 027	16, 682	36, 796	20, 114	1. 23
21	Soap	23	1, 027	1, 396	14, 437	33, 497	19, 060	1. 16
22	Clothing (except work clothes), men's, youth's, and boy's, n. e. c.	167	6, 488	7, 393	17, 097	33, 823	16, 726	1. 02
23	Clothing, women's, exclusive of corsets and allied garments and garments made in knitting mills	277	6, 022	7, 206	19, 071	35, 649	16, 578	1. 01
24	Silk manufactures	33	7, 357	7, 616	23, 219	38, 220	15, 001	. 92
25	Jewelry	135	5, 216	6, 574	12, 206	26, 781	14, 575	. 89
26	Tools, not including edge tools, machine tools, files, or saws	72	4, 589	5, 838	5, 061	19, 113	14, 052	. 86
27	Patent and proprietary medicines and compounds	54	1, 017	1, 102	6, 477	20, 190	13, 713	. 84
28	Boot and shoe findings, not made in boot and shoe factories	253	5, 157	5, 822	19, 868	33, 476	13, 608	. 83
29	Carpets and rugs, wool, other than rag	10	4, 473	5, 613	10, 638	22, 680	12, 042	. 73
30	Boxes, paper and other, n. e. c.	117	5, 300	5, 135	12, 505	24, 264	11, 759	. 72
31	Wire drawn from purchased bars or rods	15	3, 805	6, 242	11, 292	22, 882	11, 590	. 71
32	Boot and shoe cut stock, not made in boot and shoe factories	140	2, 606	3, 008	40, 259	50, 648	10, 389	. 63
33	Steam fittings and steam and hot-water heating apparatus	24	3, 320	4, 905	4, 531	14, 807	10, 276	. 63
34	Ship and boat building, steel and wooden, including repair work	38	4, 185	6, 479	4, 403	14, 152	9, 749	. 59
35	Car and general construction and repair, steam railroad repair shops	16	4, 833	7, 842	11, 891	20, 984	9, 093	. 55
36	Beverages	206	1, 182	1, 651	5, 305	14, 160	8, 855	. 54
37	Motor-vehicle bodies and motor-vehicle parts	52	3, 993	5, 878	10, 073	18, 719	8, 646	. 53
38	Petroleum refining	3	1, 077	1, 615	32, 185	40, 291	8, 106	. 50
39	Emery wheels and other abrasives and polishing appliances	14	1, 753	2, 795	5, 510	13, 481	7, 971	. 49
40	Stationery goods, n. e. c.	28	2, 608	2, 656	6, 945	14, 763	7, 818	. 48
41	Slaughtering and meat packing, wholesale	40	3, 191	4, 127	51, 140	58, 797	7, 657	. 47
42	Marble, granite, slate, and other stone products	157	2, 166	3, 820	3, 208	10, 833	7, 625	. 47
43	Planing-mill products, not made in planing mills connected with sawmills	147	2, 298	3, 876	6, 595	14, 138	7, 543	. 46
44	Machine tools	30	2, 159	3, 315	3, 359	10, 830	7, 471	. 46
45	Paper goods, n. e. c.	54	2, 007	2, 414	11, 015	18, 241	7, 226	. 44
	First 45 industries	6, 560	457, 888	555, 255	1, 252, 402	2, 510, 845	1, 258, 443	76. 78
	All other	3, 477	120, 180	150, 675	426, 410	807. 007	380, 597	23. 22
	State total for all industries	10, 037	578, 068	705, 930	1, 678, 812	3, 317, 852	1, 639, 040	100. 00

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

Leading Industries of Connecticut, Ranked According to Value Added by Manufacture, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Foundry and machine-shop products n. e. c.	175	16, 799	24, 206	25, 327	86, 168	60, 841	8. 83
2	Brass, bronze, and other nonferrous alloy and manufacture of these alloys and coppers, n. e. c.	67	20, 442	28, 538	97, 279	152, 390	55, 111	8. 00
3	Hardware, n. e. c.	57	18, 201	22, 299	21, 174	68, 013	46, 839	6. 80
4	Electrical machinery, apparatus and supplies	70	14, 500	16, 999	34, 799	75, 926	41, 127	5. 97
5	Cotton goods	35	12, 639	13, 140	26, 021	49, 178	23, 156	3. 36
6	Silk manufactures	35	9, 183	11, 401	25, 417	47, 498	22, 081	3. 21
7	Typewriters and supplies	6	8, 721	10, 701	5, 207	26, 135	20, 928	3. 04
8	Hats, fur, felt	34	5, 548	7, 999	20, 099	37, 758	17, 659	2. 56
9	Plated ware	25	5, 536	7, 352	10, 549	26, 173	15, 624	2. 27
10	Printing and publishing, newspaper and periodical	89	1, 951	3, 520	5, 320	20, 695	15, 375	2. 23
11	Rubber goods (other than boots and shoes) and rubber tires and inner tubes	19	4, 419	5, 716	20, 072	33, 591	13, 519	1. 96
12	Machine tools	33	5, 183	7, 364	5, 550	19, 053	13, 503	1. 96
13	Woolen goods	29	5, 938	7, 265	15, 634	27, 842	12, 208	1. 77
14	Clocks, time-recording devices, and clock movements	9	4, 891	5, 751	4, 101	16, 166	12, 066	1. 75
15	Bread and other bakery products	290	2, 099	3, 128	8, 934	17, 435	8, 501	1. 23
16	Corsets and allied garments	17	3, 138	2, 805	6, 838	15, 199	8, 361	1. 21
17	Gas, manufactured, illuminating and heating	20	1, 447	2, 262	5, 184	13, 319	8, 135	1. 18
18	Steam-fitting and steam and hot-water heating apparatus	9	2, 513	3, 536	2, 900	10, 432	7, 532	1. 09
19	Tools, not including edge tools, machine tools, files, or saws	49	2, 830	3, 734	4, 112	11, 586	7, 474	1. 09
20	Worsted goods	11	3, 055	4, 397	14, 673	22, 103	7, 430	1. 08
21	Cotton small wares	18	2, 733	2, 965	6, 139	13, 460	7, 322	1. 06
22	Dyeing and finishing textiles	20	2, 551	3, 256	4, 812	11, 779	6, 967	1. 01
23	Paper	32	1, 898	2, 753	9, 228	16, 154	6, 926	1. 01
24	Firearms	8	3, 018	3, 858	2, 813	9, 617	6, 804	. 99
25	Needles, pins, hooks and eyes, and snap fasteners	13	2, 353	2, 712	2, 358	8, 482	6, 124	. 89
26	Cutlery (not including silver and plated cutlery) and edge tools	25	2, 585	3, 160	2, 447	8, 431	5, 984	. 87
27	Printing and publishing, book and job	162	1, 721	2, 438	2, 512	8, 260	5, 748	. 83
28	Engines, turbines, and water wheels	13	1, 206	1, 739	2, 470	7, 217	4, 747	. 69
29	Clothing, women's, exclusive of corsets and allied garments and garments made in knitting mills	48	2, 404	2, 223	3, 737	8, 192	4, 455	. 65
30	Boxes, paper and other n. e. c.	42	2, 021	2, 125	4, 592	8, 917	4, 325	. 63
31	Stamped and enameled ware, n. e. c.	24	1, 881	1, 999	2, 805	6, 961	4, 156	. 60
32	Wire drawn from purchased rods or bars	5	894	1, 395	3, 600	7, 290	3, 690	. 54
33	Sewing machines, cases, and attachments	3	1, 552	2, 077	581	3, 959	3, 378	. 49
34	Planing-mill products, not made in planing mills connected with sawmills	62	967	1, 503	2, 490	5, 484	2, 994	. 43
35	Wirework, n. e. c.	21	951	1, 135	1, 745	4, 726	2, 981	. 43
	First 35 industries	1, 575	177, 768	227, 451	411, 419	905, 490	494, 071	71. 74
	All other industries	1, 302	63, 038	77, 053	184, 595	379, 249	194, 653	28. 26
	State total for all industries	2, 877	240, 806	304, 504	596, 014	1, 284, 739	688, 724	100. 00

Note.—The abbreviation n. e. c. indicates "not elsewhere classsfied."

LEADING INDUSTRIES OF RHODE ISLAND, RANKED ACCORDING TO VALUE ADDED BY MANUFACTURE, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Cotton goods	66	26, 203	27, 587	45, 669	90, 053	44, 384	15. 90
2	Worsted goods	71	21, 114	22, 338	79, 525	118, 310	38, 785	13. 90
3	Dyeing and finishing textiles	62	9, 590	11, 521	19, 566	44, 979	25, 413	9. 10
4	Jewelry	188	7, 826	8, 696	16, 587	35, 451	18, 864	6. 76
5	Silk manufactures	31	6, 500	7, 853	20, 698	32, 511	11, 813	4. 23
6	Textile machinery and parts	41	3, 425	4, 766	4, 497	15, 390	10, 893	3. 90
7	Cotton small wares	50	4, 191	4, 151	8, 523	16, 732	8, 209	2. 94
8	Woolen goods	24	3, 275	4, 162	11, 597	19, 256	7, 659	2. 74
9	Foundry and machine-shop products, n. e. c.	47	2, 184	3, 290	4, 296	10, 463	6, 167	2. 21
10	Electrical machinery, apparatus, and supplies	14	1, 431	1, 914	7, 572	13, 355	5, 783	2. 07
11	Printing and publishing, newspaper and periodical	27	709	1, 342	1, 551	6, 682	5, 131	1. 84
12	Rubber goods, other than tires, inner tubes, and boots and shoes	7	2, 044	1, 907	4, 769	9, 606	4, 837	1. 73
13	Bread and other bakery products	133	1, 246	1, 651	4, 864	9, 377	4, 513	1. 62
14	Gas, manufactured, illuminating and heating	4	766	1, 089	3, 204	7, 512	4, 308	1. 54
15	Knit goods	21	1, 636	1, 783	6, 429	10, 725	4, 296	1. 54
16	Printing and publishing, book and job	64	782	1, 068	1, 201	3, 971	2, 770	. 99
17	Fancy and miscellaneous articles, n. e. c.	20	1, 174	906	1, 456	3, 505	2, 049	. 73
18	Lace goods	10	846	927	1, 143	2, 793	1, 650	. 59
19	Bolts, nuts, washers, and rivets, not made in rolling mills	5	761	882	1, 279	2, 740	1, 461	. 52
20	Ship and boat building, steel and wooden, including repair work	9	600	860	1, 304	2, 493	1, 189	. 43
21	Paper goods, n. e. c.	11	400	456	1, 175	2, 345	1, 170	. 42
22	Ice cream	30	143	209	1, 203	2, 316	1, 113	. 40
	First 22 industries	935	96, 846	109, 358	248, 108	460, 565	212, 457	76. 12
	All other industries	562	23, 163	29, 538	64, 999	131, 668	66, 669	23. 88
	State total for all industries	1, 497	120, 009	138, 896	313, 107	592, 233	279, 126	100. 00

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

LEADING INDUSTRIES OF MAINE, RANKED ACCORDING TO VALUE ADDED BY MANUFACTURE, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Paper	25	8, 132	11, 122	53, 145	88, 595	35, 450	21. 72
2	Boots and shoes other than rubber	44	9, 740	9, 044	19, 284	36, 663	17, 379	10. 65
3	Cotton goods	17	10, 195	9, 781	17, 351	34, 414	17, 063	10. 45
4	Woolen goods	50	6, 140	7, 525	16, 965	30, 025	13, 060	8. 00
5	Worsted goods	9	4, 244	4, 642	11, 368	21, 849	10, 481	6. 42
6	Pulp (wood and other fiber)	26	3, 752	5, 018	30, 133	40, 280	10, 147	6. 22
7	Lumber and timber products, n. e. c.	185	3, 898	3, 614	4, 291	10, 664	6, 373	3. 90
8	Printing and publishing, newspaper and periodical	53	973	1, 205	1, 854	6, 596	4, 742	2. 91
9	Bread and other bakery products	127	946	1, 113	3, 584	6, 894	3, 310	2. 03
10	Foundry and machine shop products, n. e. c.	31	1, 048	1, 364	1, 520	4, 272	2, 752	1. 69
11	Wood, turned and shaped, n. e. c.	53	1, 482	1, 305	2, 006	4, 671	2, 665	1. 63
12	Canning and preserving, fish, crabs, shrimps, oysters, and clams	62	1, 888	905	4, 104	6, 589	2, 485	1. 52
13	Car and general construction and repairs, steam railroad repair shops	11	1, 239	1, 871	1, 812	4, 007	2, 195	1. 34
14	Marble, slate, granite, and other stone products	40	924	319	520	2, 697	2, 177	1. 33
15	Canning and preserving, fruits and vegetables, pickles, jellies, preserves, and sauces	78	916	622	3, 517	5, 323	1, 806	1. 11
16	Planing mill products, not made in planing mills connected with sawmills	36	499	618	1, 621	2, 952	1, 331	. 82
17	Printing and publishing, book and job	56	360	475	502	1, 677	1, 175	. 72
18	Gas, manufactured, illuminating and heating	10	234	330	773	1, 875	1, 102	. 68
19	Ice cream	20	193	218	1, 411	2, 498	1, 087	. 67
20	Wooden goods, n. e. c.	11	414	425	671	1, 654	983	. 60
21	Boxes, wooden, except cigar boxes	10	543	531	1, 298	2, 126	828	. 51
22	Shirts	8	602	398	853	1, 647	794	. 49
23	Ship and boat building, steel and wooden, including repair work	21	343	423	525	1, 307	782	. 48
24	Boot and shoe findings, not made in boot and shoe factories	5	264	238	423	1, 132	709	. 43
25	Toys (not including children's wheel goods or sleds), games, and playground equipment	4	344	299	383	1, 090	707	. 43
26	Furniture, including store and office fixtures	12	268	298	474	1, 040	566	. 35
27	Beverages	44	95	105	405	873	468	. 29
28	Leather, tanned, curried, and finished	5	175	181	384	831	447	. 27
29	Flavoring extracts and flavoring sirups	5	30	22	346	777	431	. 26
30	Clay products (other than pottery), and nonclay refractories	16	236	276	262	684	422	. 26
	First 30 industries	1, 074	60, 117	64, 287	181, 785	325, 702	143, 917	88. 17
	All other	352	8, 025	9, 925	27, 081	46, 392	19, 311	11. 83
	State total for all industries	1, 426	68, 142	74, 212	208, 866	372, 094	163, 228	100. 00

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

LEADING INDUSTRIES OF NEW HAMPSHIRE, RANKED ACCORDING TO VALUE ADDED BY MANUFACTURE, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Cotton goods	17	14, 722	15, 142	26, 772	57, 721	30, 949	21. 28
2	Boots and shoes, other than rubber	63	12, 114	12, 151	30, 008	49, 853	19, 845	13. 65
3	Woolen goods	35	5, 007	6, 141	13, 147	24, 143	10, 996	7. 56
4	Foundry and machine shop products, n. e. c.	41	1, 885	2, 692	2, 717	9, 778	7, 061	4. 86
5	Paper	24	2, 487	3, 204	17, 670	24, 616	6, 946	4. 78
6	Pulp (wood and other fiber)	7	2, 534	3, 064	12, 873	18, 545	5, 672	3. 90
7	Textile machinery and parts	9	1, 053	1, 370	1, 692	7, 324	5, 632	3. 87
8	Lumber and timber products, n.e.c.	165	2, 306	2, 500	6, 140	10, 078	3, 938	2. 71
9	Knit goods	16	2, 032	1, 785	4, 083	7, 093	3, 010	2. 07
10	Boxes, wooden, except cigar boxes	25	1, 376	1, 376	3, 689	6, 087	2, 398	1. 65
11	Printing and publishing, book and job	37	829	1, 219	469	2, 554	2, 085	1. 43
12	Printing and publishing, newspapers and periodicals	58	377	578	478	2, 538	2, 060	1. 42
13	Planing-mill products, not made in planing mills connected with saw mills	32	770	956	1, 963	3, 856	1, 893	1. 30
14	Bread and other bakery products	76	466	620	2, 072	3, 785	1, 713	1. 18
15	Boot and shoe findings not made in boot and shoe factories	17	572	596	1, 840	3, 532	1, 692	1. 16
16	Marble, granite, slate, and other stone products	42	609	1, 046	546	2, 147	1, 601	1. 10
17	Furniture, including store and office fixtures	19	688	797	1, 259	2, 647	1, 388	. 95
18	Gas, manufactured, illuminating and heating	11	280	350	907	2, 113	1, 206	. 83
19	Clay, products (other than pottery) and nonclay refractories	12	288	407	198	812	614	. 42
20	Wood, turned and shaped, n. e. c.	21	276	282	330	907	577	. 40
21	Cotton, small wares	5	252	241	415	988	573	. 39
22	Needles, pins, hooks, and eyes, and snap fasteners	5	378	402	89	642	553	. 38
23	Ice cream	20	91	127	614	1, 157	543	. 37
24	Electrical machinery, apparatus, and supplies	6	253	226	353	887	534	. 37
25	Cooperage	8	379	392	475	974	499	. 34
	First 25 industries	771	52, 024	57, 664	130, 799	244. 777	113, 978	78. 38
	All other	257	13, 458	15, 139	51, 307	82, 751	31, 444	21. 62
	State total for all industries	1, 028	65, 482	72, 803	182, 106	327, 528	145, 422	100. 00

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

LEADING INDUSTRIES OF VERMONT, RANKED ACCORDING TO VALUE ADDED BY MANUFACTURE, 1927

	Industry	Establishments	Wage earners	Wages (thousands of dollars)	Cost of materials (thousands of dollars)	Value of products (thousands of dollars)	Value added by manufacture	
							Thousands of dollars	Per cent of State total
1	Marble, granite, slate, and other stone products	203	5, 205	8, 411	7, 870	21, 318	13, 448	20. 99
2	Machine tools	5	1, 377	1, 997	2, 469	7, 240	4, 771	7. 45
3	Woolen goods	15	2, 619	3, 058	6, 982	10, 940	3, 958	6. 18
4	Paper	14	982	1, 196	5, 767	8, 712	2, 945	4. 60
5	Lumber and timber products, n. e. c.	127	1, 652	1, 534	1, 634	4, 552	2, 918	4. 55
6	Knit goods	7	1, 184	1, 103	2, 425	5, 160	2, 735	4. 27
7	Furniture, including store and office fixtures	12	1, 183	1, 319	1, 383	3, 508	2, 125	3. 32
8	Foundry and machine-shop products, n. e. c.	24	704	1, 081	1, 012	3, 119	2, 107	3. 29
9	Cotton goods	4	1, 008	1, 055	1, 361	3, 146	1, 785	2. 79
10	Wood, turned and shaped, n. e. c.	36	756	666	970	2, 401	1, 431	2. 23
11	Printing and publishing, newspapers and periodicals	35	243	361	254	1, 461	1, 207	1. 88
12	Car and general construction and repairs, steam railroad repair shops	5	715	1, 055	703	1, 908	1, 205	1. 88
13	Tools, not including edge tools, machine tools, files, or saws	9	459	474	814	1, 933	1, 119	1. 87
14	Minerals and earths, ground or otherwise treated	7	209	283	287	1, 389	1, 102	1. 72
15	Feeds prepared for animals and fowls	6	148	165	7, 244	8, 300	1, 056	1. 75
16	Bread and other bakery products	44	279	382	1, 456	2, 465	1, 009	1. 57
17	Patent and proprietary medicines and compounds	9	132	110	616	1, 597	981	1. 53
18	Planing mill products, not made in planing mills connected with sawmills	20	373	428	1, 301	2, 114	813	1. 27
19	Printing and publishing, book and job	24	289	436	367	1, 141	774	1. 21
20	Paper goods, n. e. c.	5	201	201	1, 752	2, 340	588	. 92
21	Gas, manufactured, illuminating and heating	9	91	128	343	870	527	. 82
22	Ice cream	12	46	71	531	1, 054	523	. 82
23	Textile machinery and parts	4	202	273	193	678	485	. 76
24	Toys (not including childrens wheel goods or sleds), games and playground equipment	5	314	329	228	692	464	. 72
25	Butter	54	98	122	2, 867	3, 320	453	. 71
26	Condensed and evaporated milk	9	97	117	2, 052	2, 486	434	. 68
27	Pulp (wood and other fiber)	4	126	162	632	1, 039	407	. 64
28	Lime	8	170	202	344	700	356	. 56
	First 28 industries	716	20, 862	26, 719	53, 857	105, 583	51, 726	80. 73
	All other	164	5, 379	5, 586	16, 100	28, 447	12, 347	19. 27
	State total for all industries	880	26, 241	32, 305	69, 957	134, 030	64, 073	100. 00

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

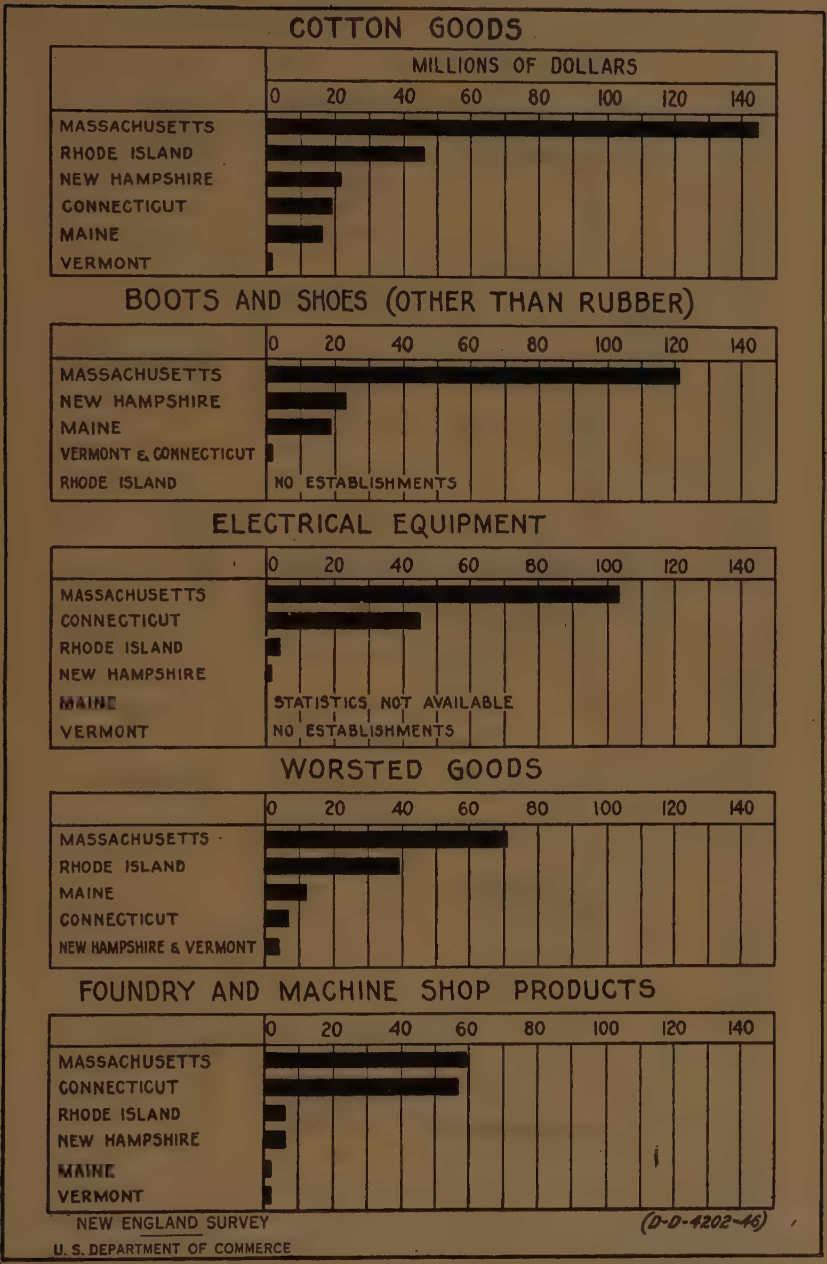


Figure 30.—Rank of New England States in leading industries according to value added by manufacture in 1925

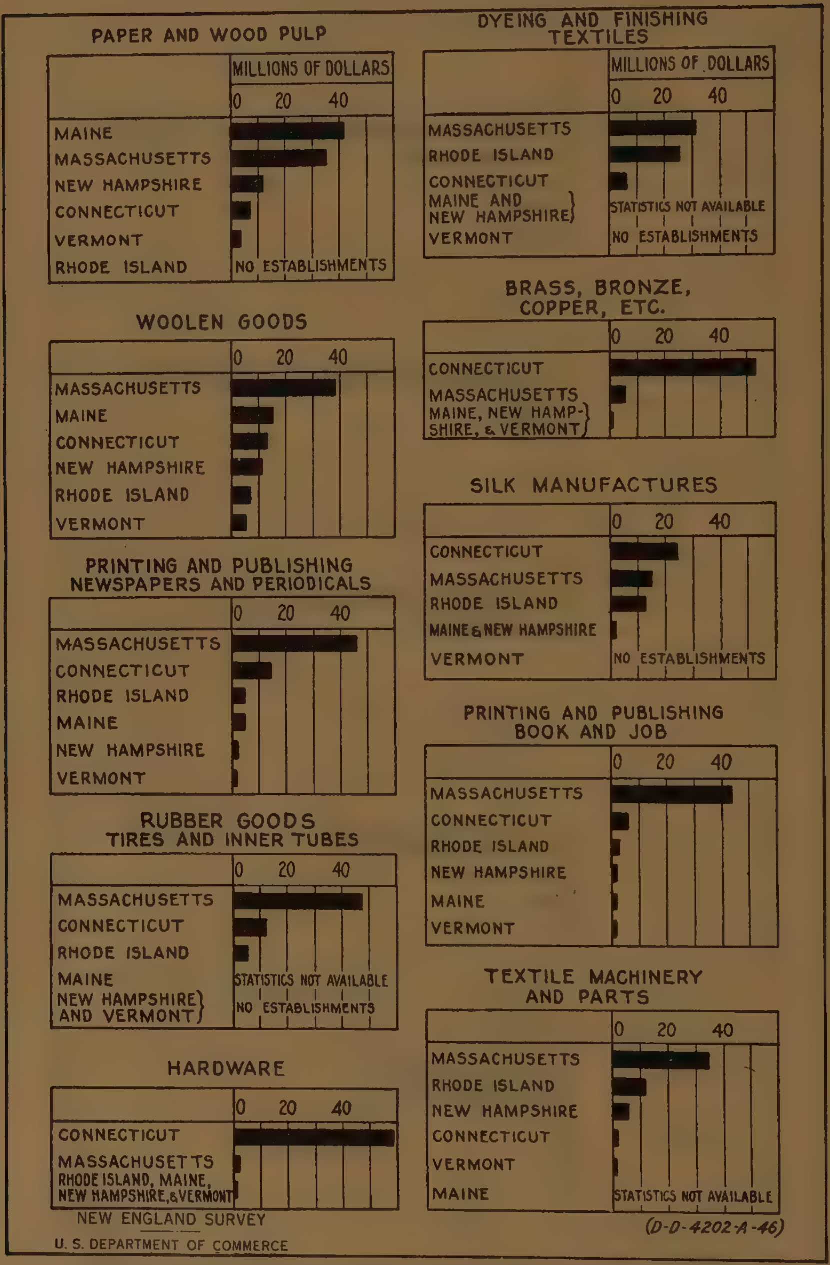


Figure 31.—Rank of New England States in leading industries in 1925

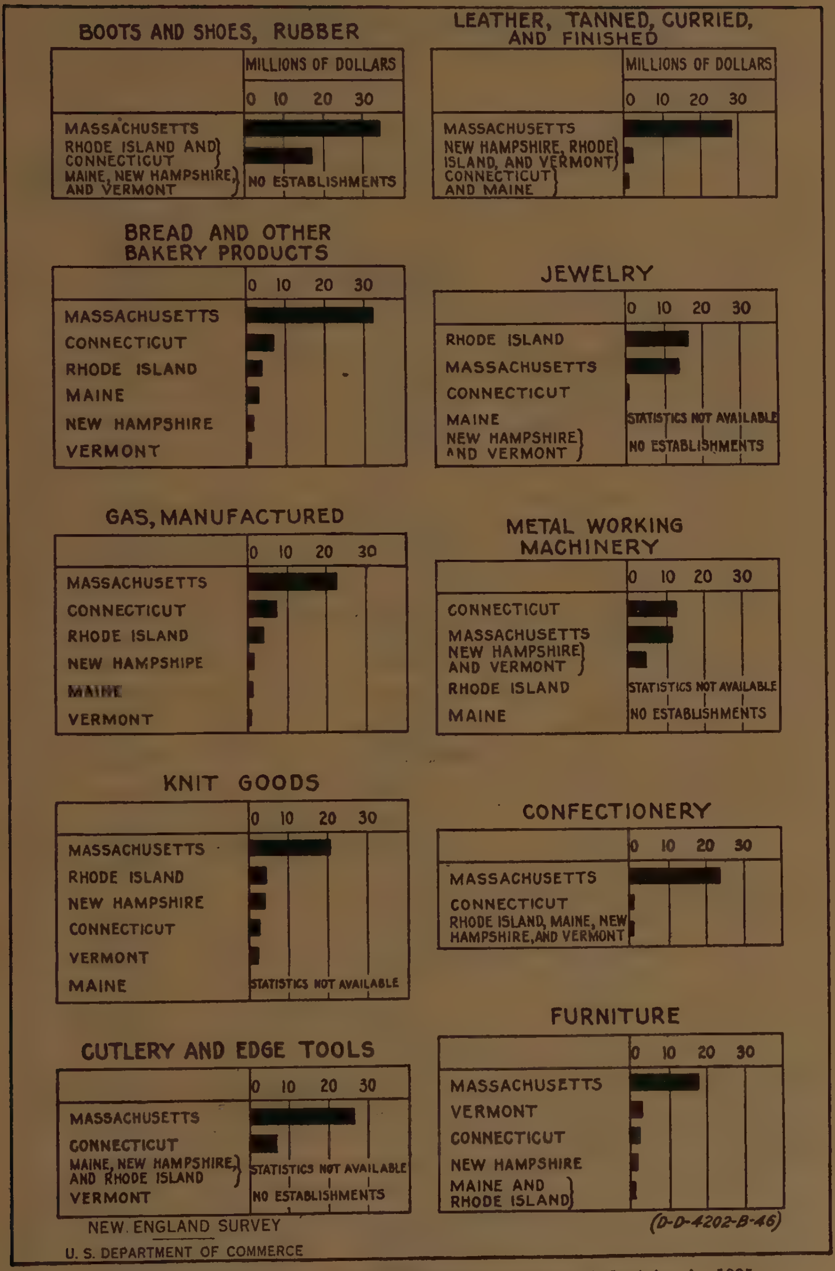


Figure 32.—Rank of New England States in leading industries in 1925

POSITION OF STATES IN LEADING NEW ENGLAND MANUFACTURES

[Ranked according to value added by manufacture in 1927]

Product	State	Value of product	Value added by manufacture	
			State total	Per cent of New England total
1. Cotton goods	Massachusetts	$284,706,000	$139,075,000	54.24
	Rhode Island	90,054,000	44,384,000	17.31
	New Hampshire	57,722,000	30,949,000	12.07
	Connecticut	49,178,000	23,156,000	9.03
	Maine	34,414,000	17,064,000	6.65
	Vermont	3,146,000	1,785,000	.70
2. Boots and shoes other than rubber	Massachusetts	237,517,000	117,163,000	75.89
	New Hampshire	49,853,000	19,845,000	12.85
	Maine	36,663,000	17,379,000	11.26
3. Electrical machinery and supplies	Massachusetts	139,349,000	97,151,000	67.19
	Connecticut	75,926,000	41,127,000	28.44
	Rhode Island	13,355,000	5,783,000	4.00
	New Hampshire	887,000	534,000	.37
4. Foundry and machine-shop products, n. e. s.	Massachusetts	94,149,000	63,390,000	44.54
	Connecticut	86,168,000	60,841,000	42.75
	New Hampshire	9,778,000	7,061,000	4.96
	Rhode Island	10,463,000	6,167,000	4.33
	Maine	4,272,000	2,752,000	1.94
	Vermont	3,119,000	2,107,000	1.48
5. Worsted goods	Massachusetts	195,095,000	72,287,000	56.04
	Rhode Island	118,310,000	38,785,000	30.07
	Maine	21,849,000	10,481,000	8.13
	Connecticut	22,103,000	7,430,000	5.76
6. Paper	Massachusetts	91,095,000	40,712,000	43.78
	Maine	88,595,000	35,450,000	38.13
	New Hampshire	24,616,000	6,946,000	7.47
	Connecticut	16,154,000	6,926,000	7.45
	Vermont	8,712,000	2,945,000	3.17
7. Woolen goods	Massachusetts	73,740,000	33,399,000	41.09
	Maine	30,025,000	13,060,000	16.07
	Connecticut	27,842,000	12,208,000	15.02
	New Hampshire	24,143,000	10,996,000	13.53
	Rhode Island	19,256,000	7,659,000	9.42
	Vermont	10,940,000	3,958,000	4.87
8. Printing and publishing, newspaper and periodicals.	Massachusetts	72,314,000	50,237,000	63.79
	Connecticut	20,695,000	15,375,000	19.52
	Rhode Island	6,682,000	5,131,000	6.52
	Maine	6,596,000	4,742,000	6.02
	New Hampshire	2,538,000	2,060,000	2.62
	Vermont	1,461,000	1,207,000	1.53
9. Dyeing and finishing textiles	Massachusetts	84,460,000	33,025,000	50.49
	Rhode Island	44,979,000	25,414,000	38.86
	Connecticut	11,779,000	6,967,000	10.65
10. Brass, bronze, and other nonferrous alloys and coppers.	Connecticut	152,390,000	55,111,000	90.58
	Massachusetts	12,688,000	5,105,000	8.39
	Rhode Island	663,000	345,000	.57
	New Hampshire	402,000	284,000	.46
11. Rubber goods and tires and inner tubes (other than rubber boots and shoes).	Massachusetts	97,718,000	41,002,000	69.07
	Connecticut	33,591,000	13,519,000	22.78
	Rhode Island	9,606,000	4,837,000	8.15
12. Printing and publishing, book and job	Massachusetts	57,852,000	44,762,000	78.10
	Connecticut	8,260,000	5,748,000	10.03
	Rhode Island	3,971,000	2,770,000	4.83
	New Hampshire	2,554,000	2,085,000	3.64
	Maine	1,677,000	1,174,000	2.05
	Vermont	1,141,000	774,000	1.35

POSITION OF STATES IN LEADING NEW ENGLAND MANUFACTURES—Continued

[Ranked according to value added by manufacture in 1927]

Product	State	Value of product	Value added by manufacture	
			State total	Per cent of New England total
13. Bread and other bakery products	Massachusetts	$73,706,000	$36,604,000	65.77
	Connecticut	17,435,000	8,501,000	15.28
	Rhode Island	9,377,000	4,513,000	8.11
	Maine	6,894,000	3,310,000	5.95
	New Hampshire	3,785,000	1,713,000	3.08
	Vermont	2,465,000	1,009,000	1.81
14. Textile machinery and parts	Massachusetts	46,866,000	31,858,000	63.15
	Rhode Island	15,390,000	10,893,000	21.59
	New Hampshire	7,324,000	5,632,000	11.16
	Connecticut	2,328,000	1,583,000	3.14
	Vermont	678,000	485,000	.19
15. Hardware, n. e. c.	Connecticut	68,013,000	46,839,000	95.78
	Massachusetts	3,080,000	1,896,000	3.88
	Rhode Island	343,000	165,000	.34
16. Silk manufactures	Connecticut	47,498,000	22,082,000	45.16
	Massachusetts	38,220,000	15,001,000	30.68
	Rhode Island	32,511,000	11,813,000	24.16
17. Gas, manufactured, illuminating and heating.	Massachusetts	38,658,000	22,456,000	59.51
	Connecticut	13,320,000	8,135,000	21.56
	Rhode Island	7,512,000	4,308,000	11.42
	New Hampshire	2,113,000	1,206,000	3.19
	Maine	1,875,000	1,102,000	2.92
	Vermont	870,000	527,000	1.40
18. Boots and shoes, rubber	Massachusetts	56,440,000	37,483,000	100.00
19. Knit goods	Massachusetts	43,937,000	21,621,000	62.55
	Rhode Island	10,724,000	4,296,000	12.43
	New Hampshire	7,093,000	3,010,000	8.71
	Connecticut	5,181,000	2,862,000	8.28
	Vermont	5,160,000	2,735,000	7.91
	Maine	90,000	43,000	.12
20. Cutlery and edge tools, not including silver and plate.	Massachusetts	33,705,000	27,822,000	82.30
	Connecticut	8,431,000	5,984,000	17.70
21. Jewelry	Rhode Island	35,451,000	18,864,000	56.41
	Massachusetts	26,781,000	14,576,000	43.59
22. Leather, tanned, curried, and finished	Massachusetts	77,649,000	29,788,000	96.96
	Connecticut	1,455,000	487,000	1.59
	Maine	832,000	447,000	1.45
23. Metal working machinery, including machine tools.	Connecticut	21,833,000	15,500,000	55.32
	Massachusetts	10,830,000	7,471,000	26.67
	Vermont	7,240,000	4,771,000	17.03
	New Hampshire	406,000	275,000	.98
24. Furniture, including store and office fixtures.	Massachusetts	36,796,000	20,114,000	74.07
	Connecticut	4,466,000	2,679,000	9.87
	Vermont	3,508,000	2,125,000	7.82
	New Hampshire	2,647,000	1,389,000	5.11
	Maine	1,040,000	566,000	2.08
	Rhode Island	602,000	285,000	1.05
25. Granite, marble, slate, and other stone products.	Vermont	21,318,000	13,448,000	49.72
	Massachusetts	10,834,000	7,625,000	28.19
	Maine	2,697,000	2,177,000	8.05
	New Hampshire	2,147,000	1,600,000	5.92
	Connecticut	1,794,000	1,245,000	4.60
	Rhode Island	1,389,000	952,000	3.52

NOTE.—The abbreviation n. e. c. indicates "not elsewhere classified."

CONCENTRATION IN CITIES

To show the importance of individual cities in the manufacturing activity of New England, data are presented in the following tables giving the total manufacturing income of each city and town for which separate totals are available for 1927. Along with this information is given the official estimates of total population as of July 1, 1925.

In these tables each city is given its numerical rank according to value added by its manufactures and its rank according to population. Cities in which the numerical rank of manufactures is smaller than the numerical rank of population are those which depend upon manufacturing for their income to a higher degree than their population alone would indicate; while cities in which the numerical rank of manufacturing is greater than their rank in population are those with lesser dependence on manufacturing as a source of income. For example, Cambridge, Mass., ranks fourth in manufacturing importance but is ninth in population, thus indicating a high degree of manufacturing activity in that city. Similarly, Waterbury, Conn., ranks eleventh in manufactures but thirteenth in population, again showing high manufacturing activity. On the other hand, Portland, Me., ranks forty-fourth in manufacturing but seventeenth in population, indicating its lesser importance as a manufacturing city.

Frequently a considerable amount of manufacturing activity takes place in areas immediately adjacent to a city, but outside of its corporate limits. In comparing the figures in these tables it should be borne in mind that they cover only the corporate limits of the city and exclude activities in adjacent territories. Sometimes several cities and towns are so close to each other that they form one large urban community in which the manufacturing activities of one city extend over the boundaries of another, yet in the New England form of town and city organization each retains its separate identity.

RANK ACCORDING TO MANUFACTURING INCOME

In the first series of tables that follow, 108 cities and towns are ranked in four arbitrary groups, according to the volume of their total income from manufactures.

The first group comprises 26 cities whose total income from manufacturing exceeded $25,000,000 each in 1927. These had over one-half (54 per cent) of the total manufacturing income of the six States. Of these 26 cities, 15 were in Massachusetts, 7 in Connecticut, 3 in Rhode Island, and 1 in New Hampshire.

The second group includes 28 cities whose income from manufacturing was between $10,000,000 and $25,000,000. They were distributed by States thus: Massachusetts, 17; Connecticut, 7; Rhode Island, 1; Maine, 2; and New Hampshire, 1.

The third group contains 33 cities whose individual incomes were between $5,000,000 and $10,000,000. Sixteen of these were in Massachusetts, 5 in New Hampshire, 3 in Connecticut, 4 in Rhode Island, 3 in Maine, and 2 in Vermont.

The fourth group contains 21 cities and towns, each of which had an income from its manufactures between $1,000,000 and $5,000,000. Fourteen of these were in Massachusetts, 3 in Maine, 1 in Rhode Island, 1 in Connecticut, 1 in New Hampshire, and 1 in Vermont.

This series of tables enables the reader to locate the rank and the manufacturing importance of any New England city. Approximately 78 per cent of the total manufacturing activity of New England is accounted for by the 108 incorporated cities and towns included in the following tables. The distribution, by States, of the remaining 22 per cent follows:

NEW ENGLAND MANUFACTURING IN AND OUTSIDE OF LISTED CITIES

State	Value added by manufacture, 1927				
	State total (thousands of dollars)	In cities listed		Outside of cities listed	
		Thousands of dollars	Per cent of total	Thousands dollars	Per cent of State total
Massachusetts	1, 639, 040	1, 424, 892	87. 0	214, 148	13. 1
Connecticut	688, 724	510, 652	74. 1	178, 072	25. 9
Rhode Island	279, 126	222, 465	79. 7	56, 661	20. 3
Maine	163, 228	57, 688	35. 3	105, 540	64. 7
New Hampshire	145, 422	91, 686	63. 0	53, 736	37. 0
Vermont	64, 073	14, 556	22. 7	49, 517	77. 3
Total	2, 979, 613	2, 323, 317	78. 0	656, 296	22. 0

RANK OF NEW ENGLAND CITIES IN ORDER OF MANUFACTURING ACTIVITY

GROUP 1.—CITIES EXCEEDING $25,000,000 IN VALUE ADDED BY MANUFACTURE

City	Value added by all manufactures, 1927		Estimated population, 1925	
	Rank	Amount	Rank	Number
Boston, Mass	1	$310, 021, 000	1	779, 620
Providence, R. I	2	105, 372, 000	2	267, 918
Worcester, Mass	3	97, 371, 000	3	190, 757
Cambridge, Mass	4	90, 749, 000	9	119, 669
Bridgeport, Conn	5	87, 360, 000	6	[1] 143, 555
New Haven, Conn	6	70, 115, 000	4	178, 927
Hartford, Conn	7	69, 953, 000	5	160, 197
Lynn, Mass	8	64, 309, 000	12	103, 081
New Bedford, Mass	9	60, 656, 000	10	119, 539
Springfield, Mass	10	57, 872, 000	7	142, 065
Waterbury, Conn	11	56, 342, 000	13	100, 000
Lawrence, Mass	12	55, 807, 000	15	93, 527
Fall River, Mass	13	49, 638, 000	8	128, 993
Pawtucket, R. I	14	43, 344, 000	18	69, 760
New Britain, Conn	15	42, 687, 000	19	68, 039
Holyoke, Mass	16	42, 364, 000	21	60, 335
Lowell, Mass	17	35, 104, 000	11	110, 296
Manchester, N. H	18	33, 542, 000	16	83, 097
Woonsocket, R. I	19	32, 907, 000	25	49, 681
Pittsfield, Mass	20	31, 558, 000	29	46, 877
Brockton, Mass	21	30, 778, 000	20	65, 343
Watertown, Mass	22	30, 596, 000	47	25, 480
Chicopee, Mass	23	29, 904, 000	34	41, 882
Everett, Mass	24	29, 174, 000	33	42, 072
Bristol, Conn	25	27, 400, 000	50	24, 652
Stamford, Conn	26	25, 419, 000	35	40, 737

Rank of New England Cities in Order of Manufacturing Activity—Contd.

Group 2.—CITIES BETWEEN $10,000,000 AND $25,000,000 IN VALUE ADDED BY MANUFACTURE

City	Value added by all manufactures, 1927		Estimated population, 1925	
	Rank	Amount	Rank	Number
Meriden, Conn	27	$24, 636, 000	37	36, 292
Haverhill, Mass	28	23, 898, 000	26	49, 232
Nashua, N. H	29	21, 132, 000	42	29, 723
Fitchburg, Mass	30	20, 342, 000	30	43, 609
Norwalk, Conn	31	18, 609, 000	41	29, 743
Danbury, Conn	32	16, 497, 000	68	[1] 18, 943
Chelsea, Mass	33	16, 464, 000	28	47, 247
Somerville, Mass	34	16, 223, 000	14	99, 032
Malden, Mass	35	16, 053, 000	24	51, 789
Salem, Mass	36	15, 942, 000	31	42, 821
Taunton, Mass	37	15, 760, 000	36	39, 255
Quincy, Mass	38	15, 451, 000	22	60, 055
Peabody, Mass	39	15, 062, 000	65	19, 870
Attleboro, Mass	40	14, 531, 000	62	20, 623
Torrington, Conn	41	14, 195, 000	51	24, 533
Norwood, Mass	42	13, 787, 000	90	14, 151
Waltham, Mass	43	13, 290, 000	39	34, 746
Portland, Me	44	13, 261, 000	17	75, 333
Lewiston, Me	45	12, 922, 000	38	34, 932
Ansonia, Conn	46	12, 501, 000	67	19, 052
Southbridge, Mass	47	12, 070, 000	81	15, 489
North Adams, Mass	48	11, 732, 000	57	22, 717
Framingham, Mass	49	11, 141, 000	61	21, 078
Middletown, Conn	50	11, 074, 000	56	22, 911
Leominster, Mass	51	10, 972, 000	60	22, 120
Central Falls, R. I	52	10, 641, 000	48	25, 403
Gardner, Mass	53	10, 457, 000	69	18, 730
Norwich, Conn	54	10, 038, 000	55	23, 118

Group 3.—CITIES BETWEEN $5,000,000 AND $10,000,000 IN VALUE ADDED BY MANUFACTURE

Berlin, N. H	55	$9, 737, 000	70	18, 552
Auburn, Me	56	9, 570, 000	74	18, 073
Beverly, Mass	57	9, 132, 000	58	22, 685
Northampton, Mass	58	9, 091, 000	52	24, 145
Bristol, R. I	59	9, 059, 000	99	12, 707
Naugatuck, Conn	60	8, 826, 000	76	16, 370
Clinton, Mass	61	8, 804, 000	89	14, 180
Amesbury, Mass	62	8, 638, 000	106	11, 229
Cranston, R. I	63	8, 439, 000	40	34, 471
Plymouth, Mass	64	7, 918, 000	95	13, 176
Newton, Mass	65	7, 820, 000	23	53, 003
West Springfield, Mass	66	7, 796, 000	82	15, 326
Westfield, Mass	67	7, 785, 000	66	19, 342
Woburn, Mass	68	7, 128, 000	72	18, 370
Concord, N. H	69	7, 012, 000	59	22, 546
Biddeford, Me	70	6, 977, 000	71	18, 532
Laconia, N. H	71	6, 973, 000	105	11, 300
Newburyport, Mass	72	6, 631, 000	79	15, 656
Easthampton, Mass	73	6, 451, 000	103	11, 587
Waterville, Me	74	6, 445, 000	88	14, 424
Northbridge, Mass	75	6, 274, 000	105	10, 051
New London, Conn	76	6, 266, 000	43	29, 103
Weymouth, Mass	77	6, 090, 000	75	17, 253
Willimantic, Conn	78	6, 087, 000	97	12, 952
East Providence, R. I	79	5, 917, 000	46	26, 088
Dover, N. H	80	5, 828, 000	96	[1] 13, 029
Barre, Vt	81	5, 590, 000	107	[1] 10, 008
Greenfield, Mass	82	5, 475, 000	83	15, 246
Keene, N. H	83	5, 437, 000	101	11, 855
Gloucester, Mass	84	5, 286, 000	54	23, 375
Burlington, Vt	85	5, 223, 000	53	24, 089
Webster, Mass	86	5, 134, 000	93	13, 389
West Warwick, R. I	87	5, 094, 000	73	18, 215

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[1] Census of 1920.

RANK OF NEW ENGLAND CITIES IN ORDER OF MANUFACTURING ACTIVITY—Contd.

GROUP 4.—CITIES AND TOWNS BETWEEN $1,000,000 AND $5,000,000 IN VALUE ADDED BY MANUFACTURE

City	Value added by all manufactures, 1927		Estimated population, 1925	
	Rank	Amount	Rank	Number
Adams, Mass	88	$4, 941, 000	92	13, 525
Augusta, Me	89	4, 706, 000	87	14, 625
Marlboro, Mass	90	4, 512, 000	77	16, 236
Rutland, Vt	91	3, 733, 000	78	15, 752
Winchester, Mass	92	3, 691, 000	104	11, 565
Braintree, Mass	93	3, 599, 000	94	13, 193
Wakefield, Mass	94	3, 477, 000	80	15, 611
Milford, Mass	95	3, 378, 000	85	14, 781
Danvers, Mass	96	3, 345, 000	102	11, 798
Medford, Mass	97	3, 192, 000	27	47, 627
Derby, Conn	98	2, 647, 000	100	12, 509
Methuen, Mass	99	2, 497, 000	63	20, 606
Bangor, Me	100	2, 493, 000	45	26, 644
Melrose, Mass	101	2, 358, 000	64	20, 165
Portsmouth, N. H	102	2, 025, 000	84	14, 871
Natick, Mass	103	2, 012, 000	98	12, 871
Newport, R. I	104	1, 692, 000	44	27, 757
Bath, Me	105	1, 315, 000	86	[1] 14, 731
Arlington, Mass	106	1, 267, 000	49	24, 943
Brookline, Mass	107	1, 048, 000	32	42, 681
Dedham, Mass	108	1, 045, 000	91	13, 918

[1] Census of 1920.

LOCALIZATION BY COUNTIES

In order to show the local importance and type of manufactures in different sections of the various States, there is presented here a table containing the number of manufacturing establishments in each of the 67 counties of New England in 1925. The total number of manufacturing establishments of all kinds is shown for each State and each county in the first column of the table.

The Biennial Census of Manufactures for 1925 published no figures for individual counties. The table following was worked up from unpublished census data for presentation here, in order to show the location of New England manufacturing activity in as great detail as is possible from official sources. It is appreciated that a simple enumeration of manufacturing plants is not an accurate indicator of the volume of manufacturing activity within a county, because a single large establishment may be more important than a dozen smaller plants. But since each establishment is a separate business unit, this compilation by counties will be of distinct commercial assistance in locating these units.

NOTE.—The Market Data Handbook of the United States, recently published by the Department of Commerce (Domestic Commerce Series No. 30), includes 1927 data for each county in New England showing the number of establishments and wage earners, volume of manufacturing, and additional data on industry and marketing.

NUMBER OF ESTABLISHMENTS IN EACH COUNTY OF NEW ENGLAND, BY MAJOR GROUPS OF MANUFACTURE, 1925

State and county	All manufactures	Metals			Textiles	Leather	Rubber	Paper	Printing	Food, etc.	Chemicals	Lumber	Stone, glass, and clay	All other
		Machinery	Iron and steel	Nonferrous										
Massachusetts	10, 237	828	455	436	1, 489	1, 135	67	375	1, 067	1, 837	475	760	335	978
Barnstable	35	1	1	1	2	---	---	---	5	10	2	8	3	2
Berkshire	239	15	5	---	35	8	---	17	21	54	4	43	20	17
Bristol	837	77	38	118	157	14	2	16	62	184	27	40	23	79
Dukes	3	---	---	---	---	---	---	---	1	1	---	1	---	---
Essex	1, 517	112	30	18	87	661	4	22	92	243	63	57	30	98
Franklin	148	13	18	1	13	3	---	10	13	26	4	34	3	10
Hampden	642	69	33	24	63	8	1	66	84	124	19	21	27	103
Hampshire	140	10	6	1	23	2	1	11	13	27	4	23	7	12
Middlesex	1, 693	148	83	76	222	98	22	69	167	359	117	137	52	143
Nantucket	4	---	---	---	---	---	---	---	1	2	1	---	---	---
Norfolk	439	28	13	12	75	30	11	17	42	56	24	16	83	32
Plymouth	448	28	32	7	28	138	10	11	35	58	27	46	8	20
Suffolk	2, 813	175	109	134	549	125	11	97	451	499	133	173	51	306
Worcester	1, 279	152	87	44	235	48	5	39	80	194	50	161	28	156
Connecticut	2, 977	310	258	211	424	31	23	99	274	572	89	240	117	329
Fairfield	698	90	66	45	135	9	6	21	55	121	26	32	19	73
Hartford	635	77	74	41	48	5	1	30	71	121	16	42	32	77
Litchfield	167	15	14	13	12	---	1	3	16	43	1	30	7	12
Middlesex	144	13	14	11	24	1	2	---	7	22	6	13	6	25
New Haven	906	82	80	95	84	8	12	22	101	180	26	68	39	109
New London	234	15	9	5	62	6	1	16	13	52	10	17	11	17
Tolland	66	3	---	---	21	---	---	4	2	11	1	11	3	10
Windham	127	15	1	1	38	2	---	3	9	22	3	27	---	6
Rhode Island	1, 627	120	67	300	417	13	9	31	106	277	56	60	39	132
Bristol	40	5	---	---	11	---	2	1	2	14	---	---	2	3
Kent	79	4	1	---	45	---	---	---	7	12	3	2	2	3
Newport	42	2	---	---	1	---	---	---	9	16	2	4	---	8
Providence	1, 397	109	66	300	330	13	6	30	84	215	50	50	28	116
Washington	69	---	---	---	30	---	1	---	4	20	1	4	7	2
Maine	1, 615	44	19	17	139	57	2	58	116	468	36	457	78	124
Androscoggin	177	5	---	---	18	17	1	10	13	55	5	31	13	9
Aroostook	59	2	---	---	2	1	---	1	4	28	2	16	1	2
Cumberland	296	10	6	14	18	8	1	13	33	84	10	57	11	31
Franklin	52	2	---	---	2	1	---	1	2	13	---	28	1	2
Hancock	56	---	---	---	3	1	---	---	2	20	---	15	13	2
Kennebeck	140	9	2	---	14	7	---	9	11	42	3	30	6	7
Knox	78	2	1	---	12	1	---	---	5	21	2	8	10	16
Lincoln	35	---	---	---	1	---	---	---	2	11	---	11	1	9
Oxford	117	1	---	---	1	3	---	4	6	27	---	63	2	10
Penobscot	168	6	4	2	17	4	---	9	14	37	8	41	4	22
Piscataquis	39	---	---	---	7	1	---	---	3	6	---	18	4	---
Sagadahoc	39	3	---	---	5	2	---	4	2	7	2	9	3	2
Somerset	94	---	2	---	18	3	---	4	4	25	---	34	2	2
Waldo	51	---	---	---	4	1	---	1	2	8	---	32	2	1
Washington	93	1	2	---	2	---	---	1	4	50	3	24	2	4
York	121	3	2	1	15	7	---	1	9	34	1	40	3	5
New Hampshire	1, 113	61	15	20	113	87	---	39	89	191	33	357	63	45
Belknap	57	7	1	3	13	1	---	1	3	9	1	17	---	1
Carroll	53	---	---	---	10	1	---	---	4	3	---	29	5	1
Cheshire	125	8	1	1	4	6	---	8	3	8	10	63	5	8
Coos	51	3	1	---	2	2	---	4	4	15	2	15	1	2
Grafton	111	5	---	1	14	4	---	5	14	8	1	51	3	5
Hillsborough	275	23	5	4	28	27	---	6	22	61	7	60	20	12
Merrimack	151	7	4	8	17	3	---	5	11	30	3	42	13	8
Rockingham	125	3	1	1	5	26	---	1	11	24	5	38	8	2
Strafford	113	3	1	1	12	15	---	7	12	20	3	27	7	5
Sullivan	52	2	1	1	8	2	---	2	5	13	1	15	1	1
Vermont	1, 039	43	20	8	51	6	---	21	67	238	22	287	243	33
Addison	40	---	---	---	---	---	---	---	4	16	---	16	2	2
Bennington	62	2	4	1	10	---	---	5	3	8	2	18	5	4
Caledonia	88	3	1	2	---	---	---	1	4	28	3	26	18	2
Chittenden	106	6	3	---	8	2	---	2	12	33	4	24	2	10
Essex	15	---	---	---	---	---	---	1	1	3	---	9	1	---
Franklin	53	2	---	2	2	1	---	1	5	18	3	12	5	2
Grand Isle	4	---	---	---	---	---	---	---	---	4	---	---	---	---
Lamoille	35	2	---	---	1	1	---	---	2	7	1	17	3	1
Orange	55	---	---	---	---	---	---	1	3	18	---	29	1	3
Orleans	53	3	2	---	2	---	---	---	4	14	---	21	7	---
Rutland	117	8	2	1	6	---	---	---	7	25	4	18	43	3
Washington	222	4	4	---	7	---	---	---	7	23	3	27	145	2
Windham	90	1	2	1	2	---	---	10	9	17	1	40	3	4
Windsor	99	12	2	1	13	2	---	---	6	24	1	30	8	---

METAL MANUFACTURES

The industries which depend primarily upon metals for their raw materials comprise the most important group of all New England manufactures when regarded as a source of revenue to the region. It is estimated that in their contribution to value added by manufacture the metal industries now represent about one-third of the New England manufacturing activity. These industries contain a larger number of establishments than any other type of manufacturing in New England and pay in wages nearly as much as all the textile industries.

In dealing with this large and varied group of industries the plan is first to present a brief summary for the group as a whole and then to discuss separately each of the major branches of metal manufacture.

The discussions are based upon two main sources of information. The first is a detailed analysis of data from the Biennial Census of Manufactures, which provides the most complete summaries obtainable. This basic information is amplified by replies from a large number of concerns in response to a questionnaire covering their manufacturing and marketing experience and practice. Upward of 1,100 New England concerns in the various metal industries cooperated in providing the information summarized in the following pages. The discussion thus presents a fairly representative picture of the metal industries of New England.

The metal industries provide a manufacturing income to the region between 900 million and a billion dollars a year, as shown by the value added by manufacture. The amount for 1925 was $936,761,000, which represented 31.9 per cent of the income from all New England manufacturing activity. These industries gave employment to an average of 317,000 workers in that year and paid more than $427,000,000 in wages. Their importance as a market for materials used in manufacturing, including fuel, power, and supplies, is shown by an outlay of $676,365,000. As a provider of commodities for the Nation's consumption, the importance of the New England metal industries is indicated by a gross value of products considerably in excess of one and one-half billion dollars.

While these industries are foremost as a source of revenue to New England, they are surpassed in the number of wage earners by the textile group. The metal industries accounted for a little more than one-fourth of the total wage earners engaged in manufacturing, while textiles employed somewhat over a third. Although the metal industries accounted for but 28.2 per cent of the total number of wage earners, they paid 31.9 per cent of all the wages. The average wage in the metal industries of New England was considerably higher than that in other types of manufacturing, being $1,347.50 per worker, in contrast to an average of $1,133 per wage earner for all other manufacturing. In proportion to the value added by manufacture, wages in this group rank higher than in any other general group.

CHARACTERISTICS OF THE GROUP

The metal industries comprise a wide variety of products. The Biennial Census of Manufactures gives figures for 83 distinct metal industries in the United States, and of this number there are 55 in New England which are important enough to have separate statistics. Their products find a way into markets which are largely industrial. They are thus affected to a great extent by general industrial conditions of the country. They are less subject to variations in demand than are manufactures of goods for personal consumption. With a few exceptions, such as jewelry and silverware, the metal industries make articles whose merit depends upon utility and service rather than preference and style.

In the metal industries there are numerous links in the manufacturing chain, so that the products of one stage of manufacture provide the raw material for the next stage; hence New England manufacturers find a portion of their market within the region in the other industries as equipment and accessories. Because of the relatively high concentration of numerous lines of metal manufacture in New England the major portion of the market, however, lies outside. It is naturally of principal importance in the more highly industrialized portion of the eastern United States, bounded by the Potomac, Ohio, and Mississippi Rivers.

In a surprisingly large number of cases New England metal manufacturers cater to a nation-wide market. The location of sales and of competition, as indicated by 1,108 manufacturers in the metal industries of New England, is summarized in the following table, which shows the number of companies reporting business in the different geographical regions. Of the 1.108 replies received, 1,036 reported a portion of their sales in New England, and 502 of these gave New England as a source of competition; 579 concerns reported the major portion of sales as being outside the area, while 418 concerns reported the major portion of their sales within New England. As sources of sales and competition the States nearest New England are naturally of greatest importance, the order being the Middle Atlantic, the East North Central, and the South Atlantic States. Next in importance come the Pacific Coast States, which are followed by the other geographic divisions of the West and South.

Location of Markets and of Competition as Indicated by New England Metal Manufacturers [1]

Geographic division	Firms reporting sales in divisions listed	Firms reporting competition from divisions listed	Geographic division	Firms reporting sales in divisions listed	Firms reporting competition from divisions listed
New England	1, 036	502	East South Central	130	33
Middle Atlantic	590	300	West North Central	122	27
East North Central	386	247	West South Central	116	23
South Atlantic	180	52	Mountain	79	19
Pacific	170	27	Foreign countries	91	41

[1] Reported by 1,108 firms in the metal industries of New England.

FACTORS INFLUENCING LOCATION

Regarding the factors which in the minds of manufacturers have been of importance in determining their location in New England, labor ranked first and markets second among 1,135 questionnaire replies that were analyzed. The large numbers of highly skilled New England workmen stand out as a very important asset in the metal industries. Analysis of 631 answers showed the various reasons in the minds of these manufacturers in the following frequency: Labor conditions, 411; accessibility of markets, 369; accessible raw materials (mainly semifabricated products), 272; transportation facilities, 201; banking facilities, 192; freight rates, 170. In most cases a combination of reasons was given. In a great many cases personal reasons, such as home and family connections, affection for a particular locality, or the fact that the business had been established there by a predecessor, were given as the determining reasons in the mind of the manufacturer. Availability of local capital was often an important factor.

Labor stands first as a factor influencing location in the greater number of separate lines of metal manufacture. With the heavier and less highly fabricated metal industries, location of markets was given as the principal reason for plant location. This includes such enterprises as foundries, structural iron work, sheet metal, and wire work. In several of the machinery lines, particularly textile machinery, the near-by market afforded by other industries was the principal reason for the given location.

RAW MATERIALS

The materials consumed by New England metal industries have a considerable variety. The principal items are iron and steel, in stages of partial manufacture ranging from pig iron and blank castings to bar and sheet iron and steel and forgings, also brass, bronze, copper, tin, and other nonferrous metals, as well as precious metals. With a few exceptions, none of the New England metal industries start the manufacturing process as far back as the reduction and refining of metallic ores, although a few blast furnaces for reduction of iron ore existed there during and immediately after the World War. The principal present exception is the recently established blast furnace at Everett, Mass., which turns out pig iron for use by the metal-working industries of New England.

In the last analysis these industries depend upon outside sources for their raw materials. But in most instances each industry carries through one stage in a series of manufacturing operations wherein all but the first stage uses as raw materials the manufactured product of a preceding stage. The blast furnace referred to, having a central location as regards distribution of its product throughout New England, with a position on tidewater whereby it may transport all its raw materials by water—limestone from the coast of Maine, iron ores from Newfoundland, Sweden, Cuba, Brazil, or other tidewater sources, and by-product coke from near-by New England sources—marks an important step in the local production of the basic materials for New England metal industries.

SEASONAL VARIATION

Seasonal activity in the metal industries is less marked than in some other lines of New England manufacture. There is little seasonal variation in the market and in supplies of raw materials or in other phases of production. Fluctuations in employment follow, in general, the swing of business activity, and particularly that of industrial activity throughout the country.

INCENTIVE METHODS OF WAGE PAYMENT

The use of incentive methods of wage payment in the metal industries of New England has found in some lines a high degree of development, while in others it appears to have very little place. Analysis shows that certain industries have made outstanding progress in this respect while others are somewhat backward, as is pointed out in the discussion of the individual types of manufacture. Conditions of manufacture are so varied with different types of products that no uniform degree of such employment can be expected to find practical application.

TREND OF ACTIVITY

The general trend of activity in the New England metal industries has been upward in the last few years. There are a few exceptions where drastic readjustments have taken place. Growth in electrical machinery, in metal-working machinery, and in hardware and tools, was marked during the years following the severe postwar slump—a period when the country was oversupplied with machinery from wartime activity. According to compilations by the Electrical World, based upon monthly consumption of electrical energy by an identical group of large New England manufacturing plants, the metal industries have had a substantial and continuing upward trend since 1925.

MARKET FOR PRODUCTS

The market for products of New England metal industries includes a wide range of consumers. In the case of industrial equipment this market is of three distinct kinds. First is the field provided by demands for new equipment for industrial expansion. In addition, there is a large field for replacements of old equipment, resulting from obsolescence and depreciation.

The classification of the market for representative New England metal products, according to the type of consumption and use, would run approximately as follows:

- Industrial:
  - Machinery.
  - Foundry and machine-shop products.
  - Engines and waterwheels.
  - Brass and bronze products.
  - Copper, tin, sheet iron, wirework, etc.
  - Forgings.
  - Steam fittings.
- Personal:
  - Cutlery.
- Personal—Continued.
  - Jewelry.
  - Plated ware.
  - Silverware.
  - Clocks and watches.
  - Firearms.
- General:
  - Hardware and tools.
  - Plumbers' supplies.
  - Typewriters.
  - Sewing machines.
  - Needles, pins, etc.

Methods for reaching the markets for these products are prevailingly through direct dealing with the manufacturing consumer in the case of industrial equipment, and either through wholesale houses or direct to the retailer in the case of goods for personal or general consumption. Because each line of manufacture differs somewhat from the others in its marketing methods, these methods are discussed under each industry.

PRINCIPAL CLASSES

The most important of the metal industries in New England is the manufacture of machinery and mechanical equipment. This includes as its major items electrical equipment, textile machinery, machine tools, and a variety of special types of machinery. This group of manufactures in 1925 contributed upward of one-fourth (28 per cent) of the revenue derived from all the metal industries.

Next in order is the great variety of products included in the foundry and machine-shop group. These contributed 17 per cent of the manufacturing revenue from all the metal industries.

The group including hardware, cutlery, and mechanics' tools ranks third in importance, contributing 12.7 per cent of the total. Manufactures of brass, bronze, and other nonferrous materials are about one-half as important as the hardware group.

Jewelry, silverware, and plated ware are of nearly as great importance collectively as the brass and bronze manufactures, contributing not quite 6 per cent of the manufacturing income for all the metal industries.

Manufactures of automotive equipment, motor cycles, bicycles, and parts together represent 3.7 per cent of the total income for metals.

These five classes make up the outstanding metal manufactures of New England and together comprise about 70 per cent of the reported total manufacturing income from all the metal industries. Besides the lines enumerated, there are a number of others which make up a substantial group, constituting more than one-fourth of the total. In these the principal items are firearms, clocks, and watches, a variety of iron and steel products, besides steel shipbuilding and railroad-repair shops and equipment.

MACHINERY GROUP

ELECTRICAL MACHINERY AND APPLIANCES

The electrical-equipment industries of the United States are largely concentrated in six States, ranking as follows: New York, Illinois, Pennsylvania, Ohio, New Jersey, and Massachusetts. These six States in 1925 produced more than three-fourths of the total output for the country. In that year New England production was 15.6 per cent of the national total, while the Middle Atlantic States produced 41 per cent and the East North Central States 37.5 per cent. These three groups of States thus accounted for over 94 per cent of the output of the country.

In this branch of machinery manufacture are included establishments which are engaged in the making of machinery, apparatus, and supplies for use in the generation, transmission, and utilization of

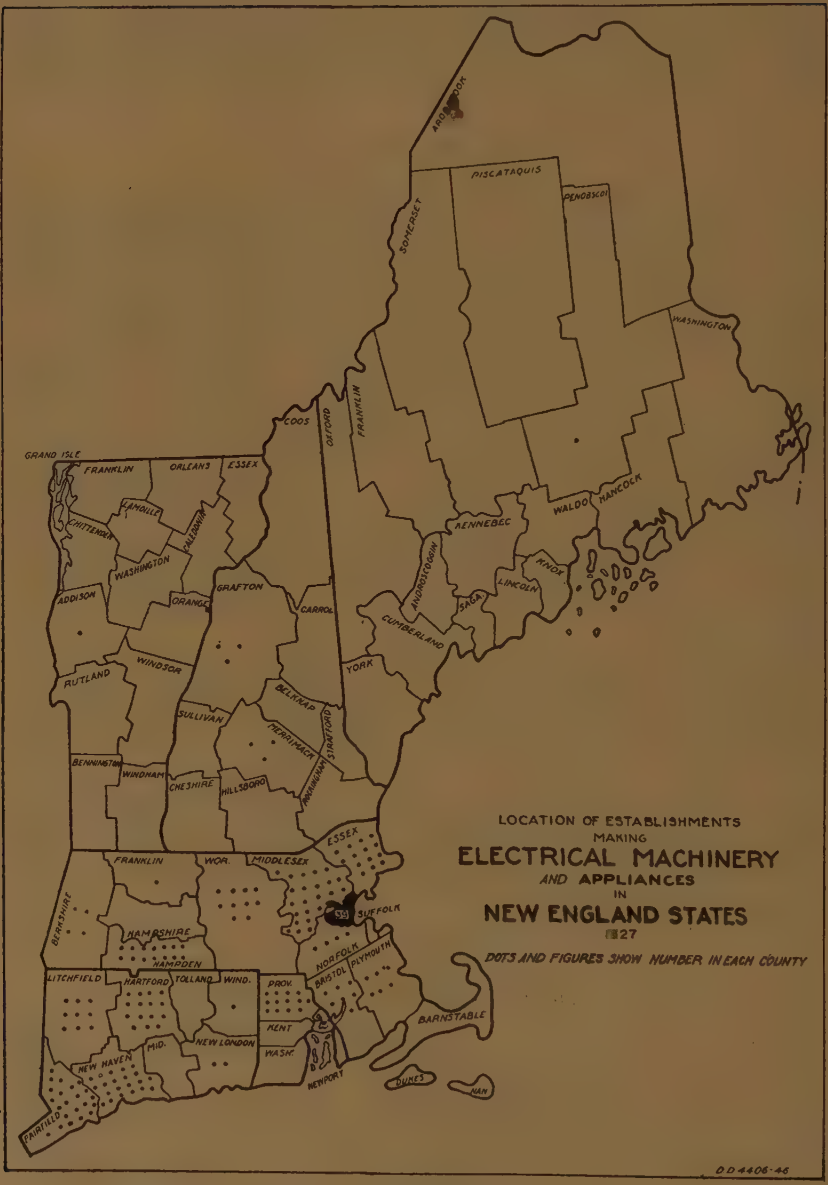
LOCATION OF ESTABLISHMENTS
MAKING
ELECTRICAL MACHINERY
AND APPLIANCES
IN
NEW ENGLAND STATES
[illegible]27
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
KNOX
LINCOLN
ANDROSCOGGIN
SAGA.
CUMBERLAND
YORK
CARROLL
GRAFTON
BELKNAP
STRAFFORD
MERRIMACK
SULLIVAN
ROCKINGHAM
CHESHIRE
HILLSBORO
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
WINDSOR
RUTLAND
BENNINGTON
WINDHAM
ESSEX
FRANKLIN
WOR.
MIDDLESEX
BERKSHIRE
HAMPSHIRE
HAMPDEN
59
SUFFOLK
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
DUKES
NAN
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
NEWPORT
MID.
NEW LONDON
NEW HAVEN
FAIRFIELD
OD 4406-46

Figure 33

electric power. The industry thus includes a very considerable variety of products, such as generators, transformers, control apparatus, electric motors, batteries, electric lamps, radio apparatus, switchboards, insulated wire, signal apparatus, searchlights, electrical appliances, and various other devices used in the electrical industries.

PLACE IN METAL-USING GROUP

The manufacture of electrical machinery and appliances is the leading metal industry of New England, representing about 15 per cent of the total value of products in the group of metals and related industries, and more than 16 per cent of the income derived from all the metal manufactures. The electrical equipment industries ranked third among all manufacturing industries of New England in their output in 1925, representing about 4 per cent of the value of all manufactured products of the area and 5.2 per cent of the revenue.

The electrical industries of New England in 1927 employed a little less than 41,000 wage earners and paid upward of $53,000,000 in wages. The average wages per wage earner in 1925 were $1,321, in comparison with the average of $1,241 in 1923 and of $589 in 1914. In comparison with other regions, however, average wages in this industry in 1925 were less in New England than for the country as a whole, the figures being $1,321 and $1,350, respectively.

The electrical industries in 1927 contributed to the income of the people of New England, as shown by the value added by manufacture, approximately $144,600,000, and their products had a gross value of $229,516,000. A relatively high contribution by the manufacturing processes is indicated for New England in the ratio shown by value added by manufacture to value of gross output; in 1925 the value added by manufacture was 70 per cent in New England, compared with 58 per cent in the Middle Atlantic States and 57 per cent in the East North Central States. The average value of product per wage earner in New England was $5,835, compared with $6,540 for the rest of the United States.

This industry shows a considerable reduction in the 2-year interval 1925 to 1927. In Rhode Island there was an increase in output and in manufacturing income amounting to about $1,000,000. The other producing States, however, show a decline.

IMPORTANCE IN SEPARATE STATES

The importance of electrical manufacturing industries in the States of New England in 1927, and the trend of growth, as indicated by figures for 1904, 1914, and 1925, are shown in the following table. Massachusetts is the leading State in New England, with 61 per cent of the output of the region and two-thirds of the regional income from this type of manufacturing, and is followed in turn by Connecticut, Rhode Island, New Hampshire, and Maine. (See fig. 33.)

MANUFACTURE OF ELECTRICAL MACHINERY, APPARATUS, AND SUPPLIES IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	122	24, 759	33, 904	42, 198	139, 349	97, 151
1925	116	25, 065	35, 109	43, 794	147, 057	103, 263
Connecticut:						
1927	70	14, 500	16, 999	34, 799	75, 926	41, 127
1925	65	14, 171	17, 074	34, 246	78, 366	44, 120
Rhode Island:						
1927	14	1, 431	1, 914	7, 572	13, 355	5, 783
1925	15	1, 302	1, 699	7, 624	12, 432	4, 807
New Hampshire:						
1927	6	253	226	353	887	534
1925	8	640	528	1, 158	2, 414	1, 256
Total:						
1927	212	40, 943	53, 043	84, 922	229, 516	144, 595
1925 [1]	204	41, 178	54, 411	86, 822	240, 269	153, 446
1914 [2]	153	23, 993	14, 136	29, 091	64, 019	34, 928
1904	120	11, 997	6, 317	14, 184	26, 407	12, 224
United States total:						
1927	1, 777	241, 566	336, 239	645, 762	1, 637, 307	991, 545
1925	1, 739	239, 921	323, 835	636, 692	1, 540, 002	903, 310
New England as per cent of United States: 1925	11. 7	17. 2	16. 8	13. 6	15. 6	17. 0

[1] Not including 1 establishment in Maine.
[2] Not including 1 establishment in Vermont.

GROWTH IN RECENT YEARS

This industry has had a very rapid growth in the last 25 years, in which New England has experienced a fair share of the national increase. The value of products of the electrical industries increased ninefold from 1904 to 1925 in the country as a whole, and it increased in New England in the same period more than eight times. The 1925 output in New England was 275 per cent greater than in 1914 and 57 per cent more than in 1919.

Establishments in New England as a whole averaged considerably larger in number of wage earners than for the rest of the country, the average being more than 200 wage earners per establishment in New England, in comparison with 129 wage earners for the rest of the United States. This is a reversal of the situation in 1904, when New England establishments employed an average of 100 wage earners, while in the rest of the United States the average was approximately 194 per establishment. The greater average size of establishments in New England is indicated by an average output of $1,177,788 per plant, in comparison with $846,732 for the rest of the United States. This is accounted for in part by the presence of several very large concerns.

EXPERIENCES OF MANUFACTURERS

In response to a special inquiry regarding their manufacturing and marketing experience, replies were received from 49 New England companies in this line, representing about one-fourth of the total number reported by the census.

Size and age of establishments.—For these 49 establishments the average period of operation was 20 years. About one-third of the number had been established within the last 10 years. With a few exceptions they had been engaged in the manufacture of electrical equipment throughout their entire existence. These exceptions included plants which had previously made automobiles, jewelry, arms, ammunition, and silk goods. Branch plants were reported by 6 companies, 2 of the branches being located in England and 1 in Germany. Several of the reporting establishments are branches of large companies whose headquarters are outside New England. About one-third of the reporting companies had made additions to their plant equipment since 1921, with increases ranging from 5 per cent up to several times their original capacity. The average output of 40 firms reporting their activity for 1925 was a little over 75 per cent of maximum capacity.

Manufacturing practices.—Methods of payment by piecework or other incentive practices were indicated by two-fifths of these reporting companies, with a variation in the proportion of workers employed under such a plan of from 20 to 100 per cent in individual cases. Moderate seasonal fluctuation was indicated in this industry by the figures of total numbers of workers on pay rolls at different quarterly periods, there being less than 10 per cent variation in the total number of wage earners employed by these reporting companies at different periods. Several plants reported the filling in of slack periods by the manufacture of radio apparatus or by making regular products for stock. Makers of lamps, in particular, reported the manufacture of goods for stock in the summer months, when they experience a lull in regular orders.

Sales and marketing.—Reports from these companies indicate that the general trend of combined sales has been decidedly upward since 1921, with a large increase each year. Increased sales were attributed, in individual cases, to demands for new products, to new sales methods, to the extension of territory, and to lowered production costs. About one-seventh of the companies replying indicated a downward trend in total sales during the last few years, the chief reason for such decreases being given as a change in the nature of demand for their products.

An increase of sales in the New England market was indicated by more than four-fifths of the reporting companies. These increased regional sales were attributed to improved quality of product, to the growth of building activity, and to greater sales effort. One manufacturer reported an increase of 200 per cent in New England sales as a result of special sales efforts. A few concerns whose sales in New England have been decreasing attribute the change to the moving of factories to the West, to the transfer of their sales activity to other industrial centers, and to the decline in street railways.

The majority of sales, as reported by these 47 companies, were made outside New England. Sales in the Middle Atlantic States were reported by 33 concerns; in the East North Central States by 26; and in the South Atlantic States by 12; while a number of companies reported a nation-wide market. Eight concerns reported that the majority of their sales were made within New England. On the basis of aggregate sales reported by 34 companies, a little less than 20 per cent of the total sales in 1925 were made within New England. Competition from within New England was indicated by about half the reporting companies, while 19 companies reported competition from the Middle Atlantic States and 11 others from the East North Central States.

Brands, trade-marks, and advertising.—The use of a brand or trade-mark on products is the prevailing practice of this industry. Two-thirds of the companies replying stated that their entire output bears an identification mark. The use of advertising was reported by over four-fifths of the reporting companies, most of which rely upon national advertising mediums in which trade journals are most common. Direct mail, dealer helps, and magazines are used to a considerable extent. Expenditures for advertising by the reporting companies represented 2 per cent of their aggregate sales in 1925, and the ratio of selling costs, exclusive of advertising, to the total value of the product in the same year was 12.7 per cent.

Distribution channels.—The principal channels through which electrical products are distributed are wholesale firms and direct sales to the consumers of the goods, the latter being manufacturers who use this equipment in making their product. Sales agents were reported in a lesser number of cases. Several concerns also made sales direct to retailers, while two companies had exclusive distributors, and one made sales direct by mail.

TEXTILE MACHINERY AND EQUIPMENT

The textile-machinery industry is closely related to the industries which manufacture textile products; its fortunes therefore depend largely upon conditions existing in textile manufacture. Textile machinery includes mechanical equipment for all stages of textile manufacture, such as the machinery for preparing raw fibers and for the preparation of yarn for weaving and knitting; looms and knitting machinery; machinery for bleaching, dyeing, printing, mercerizing, and finishing; and other miscellaneous machinery, attachments, and parts used in textile manufacture.

The country's manufacture of textile machinery and mechanical equipment for use in textile manufacture is largely centered in New England, nearly two-thirds of the national output being produced in this region. The obvious reason for this high concentration is the nearness of market in textile-manufacturing establishments. In fact, the industry, having had its early start in departments of textile mills and in plants established adjacent to them, is one of long standing in New England. Of 68 companies which reported their period of operation, 52 had been in business for more than 25 years; of this number 31 had been in operation more than 50 years, and 15 of these more than 75 years, including 4 concerns established for more than a century. Of the entire number 16 companies had come into existence within 25 years, and 6 of these within the last 10 years. More than half of the reporting companies were under their original management. Of the 68 concerns 4 indicated branch plants, all located within New England, and all but one had been established previous to 1924.

The States of Massachusetts and Rhode Island represent about four-fifths of this industry in New England, and Massachusetts contributes about two-thirds of the total. New Hampshire is also of considerable importance, and there are establishments of substantial size in Connecticut and in Maine. (See fig. 34.)

This industry in 1927 contributed not far from $53,500,000 to the revenue of New England, as shown by the value added by manufacturing; and its product had a gross value of more than $75,500,000. There were 186 establishments engaged in making textile machinery and equipment, which gave employment to upward of 17,000 wage earners and provided a pay roll exceeding $23,000,000. The industry provided a New England market for materials, including fuel, power, and supplies, exceeding $22,000,000.

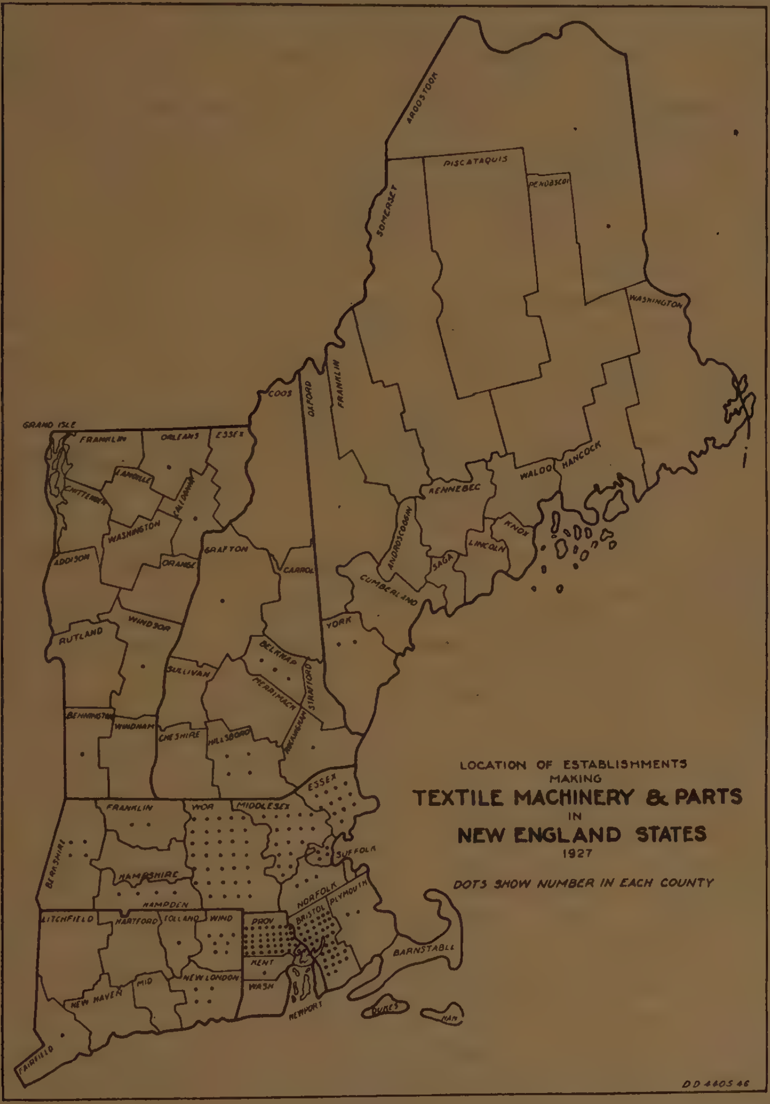
LOCATION OF ESTABLISHMENTS
MAKING
TEXTILE MACHINERY & PARTS
IN
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
ANDROSCOGGIN
KNOX
LINCOLN
SAGA
CUMBERLAND
YORK
CARROLL
GRAFTON
BELKNAP
MERRIMACK
STRAFFORD
ROCKINGHAM
SULLIVAN
CHESHIRE
HILLSBORO
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ORANGE
ADDISON
WINDSOR
RUTLAND
BENNINGTON
WINDHAM
ESSEX
FRANKLIN
WOR
MIDDLESEX
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
DUKES
NAN
LITCHFIELD
HARTFORD
TOLLAND
WIND
PROV
KENT
WASH
NEWPORT
NEW LONDON
MID
NEW HAVEN
FAIRFIELD
DD 4605 46

Figure 34

Comparison of the census figures for 1927 with those for 1925 shows for all New England, exclusive of Maine, a reduction of $2,916,000 in the gross value of the product. The falling off in the net manufacturing revenue, however, was relatively slight, amounting to only $290,000. The number of establishments was reduced from 193 to 186, and the number of wage earners fell off from 19,014 to 17,141—a loss of 1,873 workers. In total wages paid there was a reduction of $1,711,000. The falling off in activity was confined to the two principal producing States—Massachusetts and Rhode Island; there was an increase in New Hampshire, Connecticut, and Vermont. Census figures for the individual States are given for 1927 and 1925 in the following table. No comparable information is available for earlier years because this industry was not segregated from other branches of machinery manufacture previous to 1925.

MANUFACTURE OF TEXTILE MACHINERY AND PARTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	119	12,009	16,242	15,008	46,866	31,858
1925	123	13,687	17,769	16,584	51,411	34,827
Rhode Island:						
1927	41	3,425	4,766	4,497	15,390	10,893
1925	47	3,781	5,005	5,752	17,508	11,757
New Hampshire:						
1927	9	1,053	1,370	1,692	7,324	5,632
1925	8	912	1,284	1,593	6,934	5,341
Connecticut:						
1927	13	452	527	745	2,328	1,583
1925	12	420	546	612	1,973	1,361
Vermont:						
1927	4	202	273	193	678	485
1925	3	214	285	214	675	462
Total:						
1927 [1]	186	17,141	23,178	22,135	75,586	53,451
1925 [1]	193	19,014	24,889	24,755	78,502	53,747
United States total:						
1927	367	26,154	36,481	36,181	116,921	80,740
1925	379	27,869	37,464	39,037	121,653	82,616
New England as per cent of United States: 1925	50.9	68.2	66.4	63.4	64.5	65.1

[1] Not including 3 establishments in Maine.

EXPERIENCES OF MANUFACTURERS

In reply to a special inquiry information regarding volume of sales, employment, and marketing practices was submitted by 58 companies, with an aggregate employment in 1925 of 5,756 wage earners, thus representing more than one-fourth of the whole industry. Thirty-two of these concerns report an average employment of less than 25 persons each, and 19 of this number employed less than 10 wage earners each. There were 13 concerns employing between 25 and 100 workers, and 8 employed between 100 and 250. There were 5 other concerns each employing 250 workers or more, whose aggregate employment represented 62 per cent of the total reported number of wage earners. One concern had a pay roll exceeding 2,000 workers. As to volume of individual sales, there were 21 companies whose individual business in 1925 was less than $50,000; 13 concerns with annual sales between $50,000 and $100,000; 7 between $100,000 and $250,000; 7 others between $250,000 and $500,000; 6 between $500,000 and $1,000,000; and 3 with individual sales exceeding $1,000,000.

Plant practices.—About one-third of these companies reported the use of some form of incentive method of wage payment for their factory workers, while two-thirds of the number stated that they did not employ any such method. The largest employer in the group paid 70 per cent of its workers on an incentive basis, and the average proportion of factory workers reported by all the companies was slightly over 60 per cent. Reports from these companies do not indicate any pronounced seasonal variation in employment, but it fluctuates with conditions in the textile industries. A number of manufacturers reported special efforts to maintain steady employment throughout the year by the development of supplementary products, aimed to reach a wider market. A few reported repair work as a means of keeping employment uniform; the majority, however, did not indicate any form of supplementary employment. Twenty-four of the concerns indicated the manufacture of a single type of product, while 18 others reported diversified production or the addition of secondary products.

Ratio of production.—The ratio of production in 1925, as indicated by reports of 48 companies, was 53.3 per cent of maximum plant capacity. Twenty-one of these establishments reported operations at 75 to 100 per cent of the maximum, and 25 concerns between 50 and 75 per cent. Additions to plant capacity since 1921 were reported by 11 concerns, the increase ranging from 10 to 100 per cent; 3 concerns reported a doubling of capacity; and 3 others increased more than one-half. Of 10 concerns whose sales in 1925 showed an increase over those for 1923, 6 were operating at 75 per cent, or upward, of full capacity; and of 10 concerns whose sales showed a decrease in 1924 and 1925, 5 reported operations of 50 to 75 per cent of capacity, and 5 at less than half capacity. One of the plants, whose capacity had been increased by 100 per cent, reported a continuous decrease in sales since 1921.

Sales and marketing.—On the basis of reports from 50 companies, representing approximately $12,000,000 in sales in 1925, about 31 per cent of these total sales were made within New England. Twenty-seven of these companies reported the majority of their sales within New England and 23 reported less than one-half in that section. Of the total number of 68 replies 35 concerns stated that the proportion of their sales in New England had decreased since 1921 and 19 stated that they had increased, while 7 concerns reported that their New England sales in 1925 represented about the same portion of their total business as in 1921. The principal reasons given for increased sales were more efficient machinery, improved quality of product, better sales effort, and a better-known product. Companies having decreased sales in New England attributed the change to the depressed condition of the textile industry, to competition in the South, to changes in demand for textile equipment, and to fully stocked mills.

Markets outside New England, ranked according to importance, were the Middle Atlantic States, the South Atlantic States, the East North Central States, and the East South Central States.

No great amount of competition outside New England was indicated by the reporting companies. Only a small amount was reported from the regions just mentioned, thus reflecting the continuing position of New England as the principal source of textile machinery for the country as a whole.

Twenty firms, out of the total of 68, reported sales in foreign countries, the range in exports being from 1 to 31 per cent in individual concerns. Only one concern reported exports exceeding 25 per cent of total business. Of 15 concerns giving full information regarding exports, with aggregate business in 1925 of $5,600,000, the average proportion of their exports was 13.4 per cent.

Methods of distribution.—The principal method of distribution indicated is direct to the consumers of the textile equipment, who are naturally manufacturers of textile products. Nearly three-fourths of the reporting concerns sell their products entirely through this direct channel. Other distribution channels mentioned were wholesalers, direct to retailer, exclusive distributors, or resident agents. The method of distribution is determined largely by the nature of the product manufactured.

Trade-marks and advertising.—Use of trade-marks on practically the entire output was reported by 37 of the 68 reporting companies. Most of the concerns reported advertising in some form as an aid in marketing their product. Of 57 concerns indicating the mediums used 35 reported national advertising and 13 used local mediums. The principal medium is the trade journal, supplemented by direct mail. A few reported the use of magazines and newspapers where the product was for household use.

Changes and improvements.—Changes and improvements in various departments or phases of their manufacturing organization are indicated by a substantial number of reporting companies. These improvements have been in the direction of executive control, methods of wage payment, plant maintenance, and accident prevention. Significant quotations from individual companies are as follows:

> "Better methods of wage payment have greatly reduced labor costs."
>
> "Better accounting methods have aided materially in controlling purchases."
>
> "Standardization of products, materials, equipment, and performance have been of greatest importance to us."
>
> "Reduced costs have resulted from standardization of products."
>
> "Expenses have been cut by reduction in number of executives."
>
> "We have developed new and better machines to meet changes in styles of hosiery."
>
> "Best results have come from an entirely new sales policy."
>
> "A better product at reduced cost has increased our number of satisfied customers."

One manufacturer whose business is mainly in the South attributes the decrease of his New England sales to "labor laws, high taxes, and freight rates, and the efforts of large corporations to reap big profits, in contrast to the smaller owner-managed firms of the South." In contrast to this opinion another manufacturer expressed himself as follows: "Trade reports to the contrary, it seems to us that the textile-finishing plants in New England have increased during this period, although probably not in proportion to our increased volume of sales. Superior quality and greater sales energy are partly responsible."

MACHINE TOOLS

The manufacture of machine tools and of other machinery used in metal working is an industry in which New England contributes upward of one-fourth of the total national output. The products of this line of manufacture are power-driven machines for cutting, shaping, or otherwise working metals, including such items as drills, gear cutters, grinders, lathes, planers, hammers, milling machines, punching machines, presses, shapers, and screw machines; bending, boring, and broaching machines; and various other machines used in metal working. The principal products of this industry in New England come under the heading of machine tools, which are designed for more or less general use rather than for the making of special articles. This industry bears a close relationship to the entire machinery industry, and is substantially important because it is the source of much of the machinery used in other manufactures.

The first concern of any particular importance for building machine tools was founded in Providence, R. I., in 1833. Plants were also established in Worcester, Mass., in that year and in 1849. Other early concerns in this line were established at Fitchburg, Mass., in 1838; in Windsor, Vt., in the same year; and at Hartford, Conn., in 1860. These early New England plants were followed shortly afterward by establishments in Newark, N. J., and in Philadelphia. The industry did not become established in the Middle West until after the Civil War.

LEADING PRODUCING STATES

New England, the Middle Atlantic States, and the East North Central States produce practically all the machine tools and other metal-working machinery made in the United States. In 1899 the New England States produced about 32 per cent of the national total; New York, New Jersey, and Pennsylvania together, 26 per cent; Ohio, 30 per cent; and Illinois, Indiana, Michigan, and Wisconsin most of the remaining 12 per cent.[1]

The contribution of New England to the national total, both in 1904 and 1914, was approximately 35 per cent, while the contribution of Ohio advanced from 25 per cent in 1904 to 29 per cent in 1914. The Middle Atlantic States receded from 24 per cent in 1904 to 18 per cent in 1914; while the East North Central States, exclusive of Ohio, advanced from 16 to 18 per cent in the same years. The relative importance of the Middle Atlantic States has thus decreased, while that of the East North Central States, outside of Ohio, increased. The proportions of the machine-tool business located in New England and in Ohio, respectively, have greatly changed since 1889.

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[1] As reported by Eric Oberg in "Machinery," Sept., 1927, pp. 43–47.

In 1925 the contribution of New England in metal-working machinery and machine tools was estimated to be 30 per cent of the total national value of products of these industries, and 32 per cent of the national income from this source, as shown in value added by manufacture. The highly fabricated nature of the industry in New England is shown by the fact that value added by manufacture comprised 73 per cent of the gross value of its manufactured products, while the average for the United States as a whole was 69 per cent.

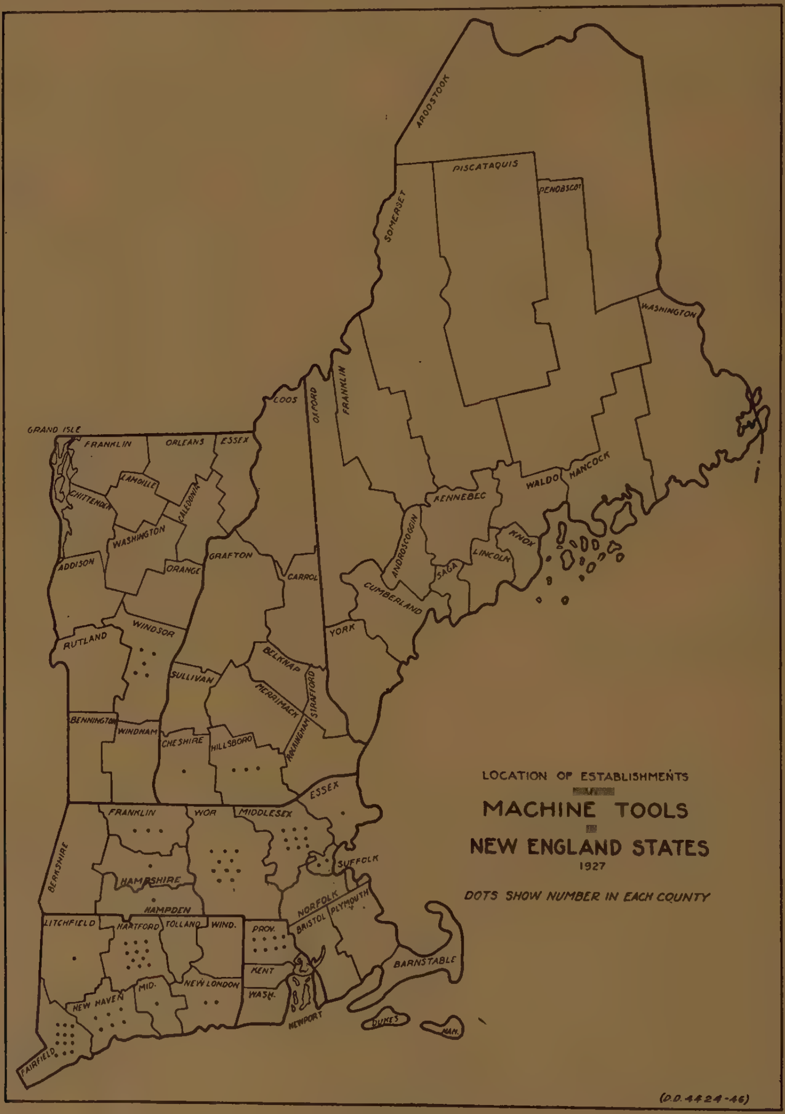
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROL
KENNEBEC
ANDROSCOGGIN
WALDO
HANCOCK
KNOX
LINCOLN
SAGA
CUMBERLAND
WINDSOR
RUTLAND
YORK
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
LOCATION OF ESTABLISHMENTS
[redacted]
MACHINE TOOLS
[redacted]
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
FRANKLIN
WOR
MIDDLESEX
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
BARNSTABLE
NEW HAVEN
MID-
NEW LONDON
NEWPORT
DUKES
NAN.
FAIRFIELD
(D.D.4424-46)

Figure 35

IMPORTANCE IN NEW ENGLAND

Census figures for this industry show a very substantial increase from 1925 to 1927. In the four States for which separate figures are available—Connecticut, Massachusetts, Vermont, and New Hampshire—there was an increase of more than $14,000,000 in the gross value of the output and of more than $12,000,000 in the net manufacturing income. The number of wage earners in these four States showed an increase of 1,325 workers, and wage payments in 1927 were $1,700,000 greater than in 1925. In number of establishments there was a reduction in Massachusetts from 36 to 30, an increase in Connecticut from 37 to 42, and a decrease of 1 each in Vermont and New Hampshire. The gross value of the output in Connecticut increased by more than $5,000,000, and the net manufacturing income of the State showed an increase of more than $3,000,000. There were corresponding reductions in the figures for Massachusetts. In Vermont and New Hampshire the industry showed substantial increases.

Although complete figures are not obtainable for all the States of New England, it is estimated that the total value of the output in this industry in 1925 exceeded $50,000,000, and that it contributed to the New England manufacturing income between $30,000,000 and $40,000,000 as shown by the value added by manufacture. These figures include an estimate for eight establishments in the State of Rhode Island for which census figures are not published. Statistics indicate that this State produced about 8 per cent of the United States total, which would indicate a total production in 1925 valued at upward of $14,000,000, and a contribution to the State income of upward of $10,000,000, as shown by the value added by manufacture.

The industry is of some importance in each State of New England except Maine, but its importance in New Hampshire is relatively slight, with a product of less than $500,000. In Vermont it ranks third in importance among that State's manufactures, with an output of more than $6,500,000 and a contribution to the State income from the manufacturing processes of considerably more than $4,000,000. Connecticut leads in individual State output and in State income from this source, but the three States of Connecticut, Massachusetts, and Rhode Island are not far apart in importance as producers. In each of these the income derived from the manufacture of metal-working machinery exceeded $10,000,000 in 1925. (See fig. 35.)

Nearly 8,000 workers were employed and nearly $12,000,000 were paid in wages in the four States of Connecticut, Massachusetts, New Hampshire, and Vermont. In these four States the industry provided a market for materials, including fuel, power, and other purchased supplies, exceeding $10,000,000. The importance of the manufacture of metal-working machinery in each of the States for which separate figures are obtainable is shown for 1925 and 1927 in the next table.

MANUFACTURE OF METAL-WORKING MACHINERY, INCLUDING MACHINE TOOLS, IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	42	5, 720	8, 218	6, 333	21, 833	15, 500
1925	37	4, 208	6, 433	3, 956	16, 488	12, 492
Massachusetts:						
1927	30	2, 159	3, 315	3, 359	10, 830	7, 471
1925	36	2, 530	3, 721	4, 063	15, 459	11, 397
Vermont:						
1927	5	1, 377	1, 997	2, 469	7, 240	4, 771
1925	6	1, 159	1, 720	2, 318	6, 673	4, 355
New Hampshire:						
1927	4	78	135	131	406	275
1925	5	72	92	100	302	202
Total:						
1927[1]	81	9, 334	13, 666	12, 291	40, 309	28, 017
1925[2]	84	7, 969	11, 966	10, 438	38, 883	28, 445
United States total:						
1927	417	41, 394	62, 324	56, 976	191, 262	134, 285
1925	378	36, 825	55, 931	54, 524	175, 592	121, 068
New England as per cent of United States: 1925	22. 2	25. 3	21. 4	19. 1	22. 1	23. 5

[1] Not including 7 establishments in Rhode Island.
[2] Not including 8 establishments in Rhode Island.

RAW MATERIALS

The principal raw materials purchased by manufacturers in this line are steel, gray-iron castings, pig iron, and some other metals. Supplies of gray-iron castings, as indicated by replies of representative companies, are purchased almost entirely from New England foundries, while pig iron has heretofore been purchased mainly outside the area. Purchases of steel were evenly divided between New England and other sections, while other metals were reported generally as being purchased within New England.

LABOR COSTS

In the manufacture of machine tools labor costs are an important item, the ratio of this item to the total value of product for the country as a whole in 1925 being approximately 31 per cent. The productiveness of labor in this industry, as shown by the average value of product per wage earner, was considerably greater in New England than in some other sections of the country, the figure for New England in 1925 being $4,879 and for the United States as a whole $4,768, a difference of more than $100 in favor of New England. While the average annual wage per wage earner is greater than that for the New England metal industry as a whole, yet the average wage for workers in the machine-tool industry was slightly less in 1925 than the national average, the figures being $1,501 in New England in contrast to $1,519 for the entire United States.

EXPERIENCES OF MANUFACTURERS

Size and age of establishments.—The average age of these concerns was about 32 years, and all but three had been established prior to 1921. In all but one case the concerns had been engaged in the manufacture of machine tools as a primary product since the founding of the business. The general practice is to concentrate operations in a single establishment, as only one concern reported the operation of a branch plant. An indication of some tendency to changes in plant management in this industry appears from the fact that about one-fifth of the companies reporting had come under new management since 1921.

Manufacturing practices.—Replies were received from 47 companies regarding their manufacturing and sales practices. Use of incentive methods of wage payment, such as a piecework basis, appear to have received a lesser degree of emphasis in the metal-working industries than in some other lines of manufacture in New England. Of the 47 companies reporting, three-fourths indicated no incentive plans of wage payment in operation. Of the remaining one-fourth of the concerns, the general average, per plant, of factory employees paid on the piecework basis was 10 per cent, although individual concerns in the group reported as high as 75 per cent.

Variation in seasonal activity does not appear well defined in this industry. Production responds rather to the general trend of industrial conditions, which influence the demand for various types of machine-tool equipment. Approximately one-fourth of the reporting group of manufacturers report the development of supplementary products, but these were designed more as a means of increasing the total volume of business than of overcoming seasonal variations.

Sales and marketing.—The trend of sales in this line, as shown by reports from this representative group of manufacturers, has been generally upward since 1921. The principal market for machine tools is outside New England. Of 46 companies indicating the location of their market, 36 stated that the majority of their sales were outside this area, and 7 small concerns had their principal market within New England, while 3 companies made one-half their sales within the area. Sales were reported in all the geographic divisions of the country. Thirty concerns stated that they sold in the Middle Atlantic States, and an equal number reported sales in the east North Central States. Competition from this latter section was indicated more frequently than from any other group of States, 21 firms specifying this region, in contrast to 18 which reported competition from local sources. Only six companies mentioned competition as coming from the Middle Atlantic States, and very little competition was indicated from other sections.

Sales to the New England market, as indicated by the returns from 33 counties, comprised approximately 10 per cent of their aggregate business in 1925, with a range from 1 to 100 per cent in individual cases. A substantial number of the group reported an increase of sales to the New England market in the last few years.

Sales to foreign countries were reported by 30 concerns, ranging in individual cases from 1 per cent up to 34 per cent of total sales, the average for the group being 11 per cent.

In the distribution of products of the machine-tool industry the principal method of sale is direct dealing with the user of the product—that is, with manufacturers of various types of machinery. Some concerns, however, market their output through wholesale dealers and sales agents.

The nature of the market is indicated by the following classification of the principal types of manufactures represented in the sales of one of the larger New England makers of machine tools:

Automotive industry.
Railroads.
Agricultural implements.
Diesel and gas engines.
Electric motors, generators, and dynamos.
Gears and pulleys.
Cranes, elevators and conveying machinery.
Steam engines, pumps, and compressors.
Turbine and centrifugal machinery.
General classification, including machine tools, textiles, printing presses, and other specialty lines.

Trade-marks and advertising.—A high proportion of the companies reporting the manufacture of machine tools market their product under a company brand or trade-mark. National advertising is generally employed, four-fifths of the companies indicating this practice, in which trade journals and direct mail advertising are the prevailing mediums. The outlay for advertising represented an average of 1.8 per cent of total sales; selling costs, outside of advertising, were 11.3 per cent.

Changes and improvements.—A number of companies report the use of research, which has been of considerable value in the creation of better designs, in standardizing tools, and in bringing about more effective control of production as well as a better understanding of their customers' requirements. Frequent inventories to determine the condition of plant equipment and the advisability of replacement with more modern designs have been found profitable. This applies particularly to the utilization of special tools, giving greater speed and accuracy, which remove bottle necks in the flow of production. In this industry, where manufacturing is done largely on special order, these factors are particularly important as a means of avoiding waste and inefficiency in the use of materials, labor, and capital.

The reports indicated that this industry, in general, has been active in effecting improvements in manufacturing and selling activities. This is brought out in special comments by individual manufacturers, of which the following statements show the general tendency:

"Standardization of materials and product has reduced our costs."

"Continuous employment enables us to hold our organization together, even in slack periods."

"We have reduced our inventory by production control and by correlating schedules with sales policies."

"Minimum investment in inventories and of maximum shipments, plus quality and cost reduction, has resulted in increased profits."

"By improved construction we have increased the satisfaction of customers and reduced returns of merchandise."

"Much of our work is special; improvements in design to reduce cost or to increase efficiency of machines claim most of our attention."

Considerable attention was indicated by the reporting concerns to the improvement of sales and marketing methods and of plant management; a substantial number also indicated interest in the fuller development of export business.

MISCELLANEOUS MACHINERY

In addition to the types included in electrical, textile, and metal-working machinery, a great variety of other special and general machinery is made in New England. Conspicuous in this group are typewriters, of which the State of Connecticut contributed 37 per cent of the national output; paper-mill and pulp-mill machinery, of which the State of Massachusetts produces more than one-fourth of the national value; blowers and fans, of which Massachusetts and Connecticut produce more than 40 per cent of the total; and pumps and pumping equipment, which is of considerable importance in Massachusetts, and somewhat so in Connecticut.

No complete data are available for these kinds of machinery; but all available figures of the 1925 production in the States of New England are presented in the following statement. Some of these products are included in the totals for foundry and machine-shop products.

Special Classes of Machinery Produced in New England in 1925

Typewriters and parts:	
Connecticut	$18,471,000
Total United States	50,190,000
Pumps and pumping equipment:	
Massachusetts	13,357,000
Connecticut	3,268,000
Total United States	121,299,000
Engines (steam or internal-combustion), water wheels and parts:	
Massachusetts	6,163,000
Connecticut	4,155,000
Total United States	317,255,000
Blowers and fans:	
Massachusetts Connecticut	6,629,000
Total United States	16,210,000
Paper-mill and pulp-mill machinery:	
Massachusetts	5,541,000
Total United States	21,209,000
Printing presses:	
Connecticut	3,226,000
Total United States	69,217,000
Meters, gas and water:	
Connecticut Massachusetts	2,886,000
Total United States	24,502,000
Woodworking machinery:	
Massachusetts	2,560,000
Total	39,620,000
Packaging machines:	
Connecticut Massachusetts New Hampshire	2,051,000
Total United States	4,387,000
Confectionery and ice-cream machinery:	
Massachusetts	1,619,000
Total United States	5,143,000
Leather-working machinery, other than shoe machinery:	
Massachusetts	1,557,000
Total United States	2,222,000
Laundry machinery:	
Massachusetts	998,000
Total United States	24,198,000

Cars and trucks, industrial:	
Massachusetts	$996, 000
Total United States	24, 267, 000
Stone-working machinery:	
Vermont	689, 000
Total United States	1, 736, 000
Elevators and elevator machinery:	
Massachusetts	680, 000
Total United States	47, 430, 000
Transmission machinery:	
Massachusetts	619, 000
Total United States	15, 350, 000
Hat-making machinery:	
Connecticut	307, 000
Total United States	522, 000

EXPERIENCES OF MANUFACTURERS

One hundred and forty-four companies in Massachusetts, Connecticut, and Rhode Island submitted replies to questionnaires covering their experience in making and marketing these various types of machinery. The broad range of products covered in these replies is shown by the following summary of types reported: Paper-mill and pulp-mill machinery, 17 companies; power-transmission machinery, 17; woodworking machinery, 16; shoe machinery, 9; elevator and conveying machinery, 8; rubber-working machinery, 7; printing-press machinery, 5; stapling machinery, 5; paper-box machinery, elevator machinery, addressing and mailing machinery, baking machinery and equipment, hat-making machinery, 4 companies each; laundry machinery, leather-working machinery, confectionery and ice-cream machinery, 3 companies each; refrigeration and ice-making machinery, packing machinery, chemical-plant machinery, marking machinery, blowers and fans, envelope machinery, bookbinding machinery, stone-working machinery, 2 companies each.

In addition to these, the following were represented by one company each: Celluloid-working machinery; crushing, grinding, and separating machinery; cooling and conditioning machinery; bottling machinery; oil-mill machinery; cranberry-picking machinery; automatic-wrapping machinery; hydraulic machinery; sugar-mill machinery; glass-cutting machinery; grain-handling machinery; agricultural machinery; road-making machinery; snow-removing equipment; brake-lining machinery; mechanical-tube cleaners; vacuum cleaners; lawn mowers; scales and balances. Approximately one-half of the reporting concerns indicated the manufacture of a single type of machine, while one-half made multiple or supplementary products in addition to the specified main product.

Age and size of establishments.—About half of these companies had originated within the last 25 years; 43 had been in operation in New England between 25 and 50 years; 28 over 50 years, and 12 of these from 75 years to nearly a century. Almost half of the 137 concerns which stated the period of present management indicated some change within the last 10 years.

As indicated by reports from 105 concerns which stated their sales volume, there were 47 with annual sales of less than $50,000 and 16 with sales between $50,000 and $100,000. Business between $100,000 and $250,000 was reported by 28 concerns, and a volume between $250,000 and $500,000 by 17 others. There were also 8 companies whose individual sales were between $500,000 and $1,000,000 and 5 with annual sales exceeding $1,000,000 each. The largest individual sales volume reported by a company was nearly $4,000,000. All but one of the companies whose sales exceeded $1,000,000 in 1925 had been in operation more than 70 years. Six of the companies reported branch factories. One company making conveying machinery reported a branch plant in Ohio. A Connecticut concern making a variety of heavy machinery has a branch plant in eastern New York. A Vermont manufacturer of stone-working machinery reported a branch in New York. The other reported branches were located in New England.

The total pay roll reported by 121 concerns was 5,433 wage earners. Seventy of the companies had an average of employees of less than 25 persons each; 21 had between 25 and 50 workers, 20 between 50 and 100, and 10 companies employed more than 100 workers each, of which 3 had a pay roll exceeding 250 workers each. The largest company employed nearly 700 wage earners. Of the 121 reporting companies, more than three-fourths had an individual pay roll of less than 50 wage earners.

Raw materials.—The principal raw materials reported by this group of machinery manufacturers are steel, iron, and the nonferrous metals. One hundred and thirty companies reported the purchase of steel in its raw and semifabricated forms; 127 firms reported purchases of cast iron, pig iron, and castings; and 93 concerns reported the purchase of brass, bronze, copper, and other nonferrous metals in the raw or semifabricated forms. The majority of the concerns indicated that they purchase these supplies outside New England.

Plant capacity.—Increases in plant capacity since 1921 were indicated by 29 of the 144 concerns, the increases ranging from small amounts up to a trebling of capacity. Increases were more frequent in plants turning out a variety of products than with those making a single product. Most of the increases were in small concerns. Output in 1925, as shown by the figures of 97 concerns, averaged 70 per cent of their maximum capacity in that year. Forty-three of these latter companies were run at upward of 75 per cent, and 36 stated that their operations were from 50 to 75 per cent of full capacity; while 18 concerns reported operations at less than half of maximum capacity.

Manufacturing practices.—The use of incentive methods of wage payment does not prevail to any great extent in this form of manufacturing. Of 120 companies indicating their practices in this regard, 96 stated that no incentive methods were used. The average for 16 concerns giving figures for proportion of wage earners paid by incentive methods was 37 per cent of their total pay roll. Six of these companies stated that more than 50 per cent of their employees were paid in this manner. This included two large companies which reported 60 and 80 per cent, respectively.

Sales and marketing.—Aggregate sales of 112 concerns submitting annual sales figures for 1923, 1924, and 1925 showed a net increase in 1925 of 3.1 per cent over 1923 and of 11 per cent over 1924. Apparently no single factor accounted for individual contrasts in sales trends in these years. Increases in sales were attributed by individual companies to improvements and new models, to better services to customers, and to increased sales efforts and advertising. Decreases in individual cases were attributed to depression in certain major New England industries, to changes in types of machines used, to new purchasing policies of customers, to competition, and to freight rates.

Location of markets.—The New England market is decidedly of secondary importance in this reporting group of manufacturers. With the 102 concerns whose aggregate sales were nearly $23,000,000, less than 25 per cent of the total sales were made within New England. The order of importance of different sections of the United States as a market was indicated to be as follows: Middle Atlantic States, East North Central, South Atlantic, and East South Central States, and the States on the Pacific coast. The sources of competition mentioned most frequently were the East North Central States and the Middle Atlantic States. Several concerns stated that their sharpest competition came from within New England.

Nearly half of these companies reported that they had some export business, the percentages ranging, in individual cases, from 1 up to 55 per cent of total sales. The majority of these concerns stated that their exports were less than 10 per cent; but seven of them reported exports of 25 per cent or more. For 58 companies (whose aggregate sales exceeded $19,000,000) which gave figures on exports, the amount exported represented 9.6 per cent of the total sales.

Distribution methods.—On the basis of these replies of representative machinery manufacturers, the most common method of distribution is by direct sales to the consumer of the machinery. Out of 136 reports there were 103 concerns which indicated this channel. A small number reported exclusive distributors and a few have their own sales offices.

Brands and trade-marks.—The majority of the reporting companies reported the use of an identifying brand or trade-mark. Of 81 concerns indicating this practice, there were 61 whose entire product was specifically marked and 13 others which reported that half or more of their products were thus identified. On the other hand, there were 14 companies reporting that none of their product was so identified, while the others did not indicate their practice in this respect.

Advertising.—Of 105 concerns replying there were 67 which advertised through national mediums and 21 through local mediums, while 8 used both forms and 9 reported no advertising of any kind. Most of the concerns reporting these advertising mediums were selling their products direct to the consumer. The principal mediums, as in other mechanical lines, were trade journals and direct mail.

Changes and improvements.—The changes and improvements indicated by these machinery manufacturers are mainly changes in production and selling practices. Many of the companies reported that they have effected savings through the standardization of products and materials. Cutting down the costs of production through reforms in internal management and through the use of cost-accounting systems was indicated in several instances. The reports indicated that, in general, manufacturers in this industry are finding it necessary to change their products materially in order to meet new demands and keep up with progress in this field. Several concerns reported advance in making their products more widely known. Education of possible purchasers to the advantages and use of labor-saving machinery is the line of effort stressed in another instance. One firm states that it is continually investigating the possibility for developing products to keep employment and production regular throughout the year. By using up-to-date tools or tools of special types a small manufacturer reports success in meeting the competition of larger concerns.

On the other hand, one manufacturer states that the placing on the market of second-hand machines (which were used during the war when quantity production was necessary) at prices much below those for new machines, has had a harmful effect upon the selling of new products. Another manufacturer of machinery states that most of the new factory expansion is in the more centrally located regions of the country, and that a lack of industrial construction and expansion in New England retards the market for mechanical equipment there. A maker of paper-mill and pulp-mill machinery states that since the decrease of materials for paper making in New England, the paper mills are locating in other sections nearer the sources of supply.

A manufacturer of leather-working machinery states that many concerns in this line have started up in Pennsylvania, New York, and New Jersey, and that these are supplying the market formerly supplied by New England manufacturers. Another maker of a similar line states that the machinery is now made to a great extent in plants of former customers. A manufacturer of woodworking machinery says his market is affected by slack periods in the textile industry, because his customers in turn manufacture supplies for the textile mills. A maker of ventilating fans, whose market is with the textile and leather trades, finds that the slackness in these industries has affected their purchases of supplies. One envelope-machinery company complains of foreign competition.

FOUNDRY AND MACHINE-SHOP PRODUCTS

This group of New England manufactures is a very broad one embracing the lines which employ foundry and machine-shop processes that are not clearly segregated. The foundry, as ordinarily defined, is an establishment which casts metals in various shapes, while the machine shop uses power-driven tools for cutting and shaping metals. Many of these establishments make a great variety of products, and thus there is considerable overlapping between the present classification and other specific lines. The industry discussed here includes many foundries making castings of steel, malleable iron, or gray iron, and machine shops whose principal products are machinery and repair work not covered in other classifications. Foundries which are operated in conjunction with machine shops are included in this section, but independent foundries making castings for sale are treated separately.

This industry caters largely to local trade, and thus depends principally upon a local market. On account of the variety of products there is an extensive and varied market outlet. Nominally the jobbing foundry has a local market because the service requirements of its trade demand close touch between foundry and consumer.

The machine shops are not so dependent on local trade, particularly those making specialty products.

Foundries and machine shops are well distributed throughout New England, and they are of considerable importance in each State,

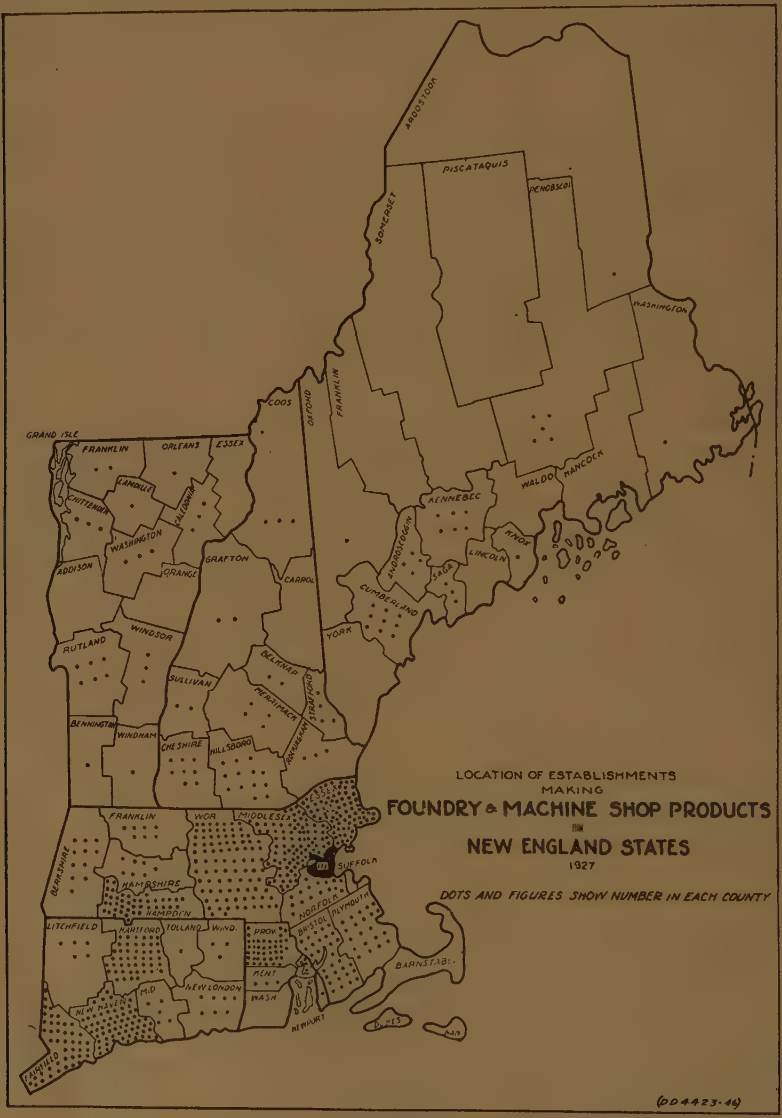
LOCATION OF ESTABLISHMENTS
MAKING
FOUNDRY & MACHINE SHOP PRODUCTS
IN
NEW ENGLAND STATES
1927
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
KENNEBEC
WALDO
HANCOCK
KNOX
LINCOLN
ANDROSCOGGIN
SAGA
CUMBERLAND
YORK
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ROCKINGHAM
ESSEX
FRANKLIN
WOR
MIDDLESEX
BERKSHIRE
HAMPSHIRE
HAMPDEN
SUFFOLK
111
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH
NEWPORT
BARNSTABLE
NEW LONDON
M.D
NEW HAVEN
FAIRFIELD
DUKES
NAN
(DD4423-46)

Figure 36

although the principal volume is naturally found in the regions where mills and factories abound, since these provide much of the market. As a source of revenue the industry is of approximately equal importance in Connecticut and Massachusetts, the contribution in 1927 exceeding $60,000,000 in each State. It is likewise of approximately equal importance in New Hampshire and Rhode Island, producing an income exceeding $6,000,000 in each case. In Maine and Vermont the manufacturing income from this source was in the neighborhood of $2,000,000 for each State.

The total addition to the New England income from this type of manufacture in 1927 exceeded $142,000,000, and the output had a gross value of nearly $208,000,000. It gave employment to more than 42,500 wage earners, who were paid in wages $62,693,000. Of the 814 establishments in New England there are almost 500 in the State of Massachusetts.

The figures of activity in this line of New England manufacture for 1927 show a substantial increase over 1925. Although the number of establishments fell off from 830 to 814, there was an increase of 366 in the average number of wage earners employed, and an increase of $1,724,000 in total wages. The gross value of the product in this 2-year interval shows an increase of $8,808,000 and the net New England income from manufacture increased more than $9,000,000, accompanied by a slight reduction in the total cost of materials. Each of the six States shows a substantial increase in the gross value of its product, and each State except Rhode Island shows considerable increase in net income.

In the following table are presented the census figures for the individual States in 1927 and 1925, together with the corresponding New England totals for 1914 and 1904.

MANUFACTURE OF FOUNDRY AND MACHINE-SHOP PRODUCTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	496	19, 898	30, 059	30, 760	94, 150	63, 390
1925	500	19, 541	28, 920	31, 046	90, 638	59, 592
Connecticut:						
1927	175	16, 799	24, 206	25, 327	86, 168	60, 841
1925	184	16, 980	24, 214	26, 665	83, 722	57, 057
Rhode Island:						
1927	47	2, 184	3, 290	4, 296	10, 463	6, 167
1925	49	2, 154	3, 079	3, 966	10, 201	6, 235
New Hampshire:						
1927	41	1, 885	2, 692	2, 717	9, 778	7, 061
1925	40	1, 788	2, 574	2, 435	8, 618	6, 183
Maine:						
1927	31	1, 048	1, 364	1, 520	4, 272	2, 752
1925	33	968	1, 206	1, 027	3, 089	2, 062
Vermont:						
1927	24	704	1, 081	1, 012	3, 119	2, 107
1925	24	721	976	1, 066	2, 875	1, 809
Total:						
1927	814	42, 518	62, 692	65, 632	207, 950	142, 318
1925	830	42, 152	60, 969	66, 205	199, 143	132, 938
1914	1, 274	62, 508	41, 395	43, 623	120, 283	76, 660
1904	1, 264	58, 892	33, 417	35, 959	99, 827	63, 868
United States total:						
1927	8, 318	397, 814	591, 065	872, 790	2, 259, 794	1, 387, 004
1925	8, 154	397, 838	570, 801	883, 708	2, 232, 986	1, 349, 278
New England as per cent of United States:						
1925	10. 2	10. 6	10. 7	7. 5	8. 9	9. 9

EXPERIENCES OF MANUFACTURERS

Special replies regarding operating practices were obtained from 136 establishments turning out various types of foundry and machine-shop products. All States are represented in these replies, although most were from Massachusetts and Connecticut. Most of these companies indicated the manufacture of multiple or supplementary articles in addition to a specified main product, and several turned out a great variety of articles.

Size and age of establishments.—Small and middle-sized establishments predominate in this group, although there were a number of large concerns. In the total of 112 companies which indicated sales volume in 1925, there were 33 with individual sales of less than $50,000; 24 with sales between $50,000 and $100,000; 21 between $100,000 and $250,000; and 13 between $250,000 and $500,000. In addition to these concerns there were 7 companies with an annual value between $500,000 and $1,000,000 each, and 14 exceeding $1,000,000 in individual sales. The aggregate volume of these 14 largest concerns represents approximately 70 per cent of the total sales of the 112 companies. Most of these large individual concerns had been in operation upward of 50 years. The largest one did an annual business approaching $10,000,000.

In terms of workmen employed, the total for the 112 companies was 10,713 wage earners. Over half of these companies employed less than 25 workmen each, and a quarter of them from 25 to 100 workers each. There were 11 concerns employing more than 250 workers, whose aggregate represented 63 per cent of the total for the whole reporting group. One establishment had a pay roll of more than 1,000, but over two-thirds of the establishments had an average pay roll of less than 50 wage earners.

Branch plants, located in different parts of the country, were reported by 10 of these companies. A maker of automatic sprinkler systems has a branch in the Middle West, and a concern making chilled-iron car wheels has branch plants in several Western States, while a concern making cast-iron brake shoes has branches in several parts of the country. A manufacturer of paper and pulp mill equipment reports a branch plant in Quebec.

Raw materials.—The chief raw materials reported by this group of manufacturers are steel, iron, and nonferrous metals. Seventy-five concerns reported the purchase of raw or semifabricated steel, and 63 the purchase of cast or pig iron, while 41 reported purchases of semimanufactured iron in the form of castings, sheets, pipe, etc. Fifty-seven companies reported purchases of brass, bronze, or copper, while other nonferrous metals or alloys were mentioned in 36 cases. The majority of these companies stated that orders for the purchase of their raw materials were placed with New England concerns or with New England agents.

Sales and markets.—The trend of sales in this line from 1921 to 1925, as indicated by figures of aggregate sales of 105 concerns, showed in 1925 an increase of 4.4 per cent over 1924, but a decrease of 4.9 per cent compared with 1923. The industry thus showed its highest activity in 1923, which was not quite reached by that of 1925. Numerous individual concerns showed substantial increase in volume of sales in this period, but a considerable number showed decreases. Reasons given for increased sales volume were the development of new products (36 firms), new sales methods (34 firms), extension of sales territories (30 firms), and lowered manufactured costs (21 firms). Other concerns attributed increased sales to lower overhead costs, increased demand, more advertising, and quality of goods. Decreased volume of business was attributed generally to changes in nature of demand, to competition with other sections, to general overproduction, and to high cost of labor and materials.

Utilization of plant capacity.—The utilization of plant capacity as indicated by reports from 93 companies in 1925 was 72.5 per cent of the maximum possible output. Slightly more than half of these companies were running at 75 per cent, or upward, of full capacity and only five establishments reported operating at less than half capacity. Increases in plant capacities since 1921 were reported in several instances. Seven concerns reported a doubling of capacity and one other an even greater increase. Several others reported increases from 25 to 50 per cent. Three companies reported a reduction of plant capacity.

Location of markets.—Sales figures from 97 firms, with an aggregate volume in 1925 of $39,550,000, indicate that about 35 per cent of their aggregate sales were made within New England. Of the total number of 112 companies indicating the locality of their market, 64 stated that more than half of their sales were made within New England, while the rest indicated less than half in that section. Markets outside New England, according to the frequency with which they were mentioned, were in the Middle Atlantic, the East North Central, the South Atlantic, the South Central, and the Pacific Coast States. The sources of competition mentioned most often were the Middle Atlantic and the East North Central States. Many of the companies find their principal sources of competition within New England.

Foreign sales were indicated by 53 concerns, and 42 of these gave the foreign sales in terms of percentage of their total business. There was a wide range—from less than 1 per cent in a small concern up to 70 per cent in a concern doing a million-dollar business. For these 42 companies whose aggregate sales in 1925 exceeded $33,000,000 the total reported exports amounted to 12 per cent. With 31 of the companies indicating foreign sales, exports amounted to less than 10 per cent, and with 19 of these they were less than 5 per cent of the total business. There were 4 other concerns which reported exports of more than 25 per cent of their total sales, and 3 of these reported more than 50 per cent.

Distribution methods.—Since the local market is an important outlet in this line of manufacture, it is to be expected that distribution of the product would be made largely by the manufacturer direct to the trade, with secondary dependence upon wholesale distributors or sales representatives. The method of distribution varies to a considerable extent with the nature of the product.

Trade-marks and advertising.—About two-thirds of the firms reported that they used an identification brand or trade-mark in marketing all or a portion of their output. Only five firms stated that they did not use any trade-mark on their products. Almost all the reporting companies made use of some form of advertising, only 11 out of the 136 companies definitely indicating that they did not advertise. Trade journals are the principal advertising medium, but direct mail is used almost as frequently. Personal calls and direct soliciting by telephone are frequently mentioned. One manufacturer of automatic sprinklers found it unnecessary because he relies upon insurance brokers to recommend his product.

Changes and improvements.—Efforts to effect improvements in various sorts of manufacturing activities were indicated by many manufacturers. These improvements follow, in general, those indicated in other lines of mechanical manufacture, with particular attention to accident prevention, the provision of various safeguards, improvement of working conditions, standardization of products, and provision for continuous plant maintenance.

A manufacturer of regulators and valves reports that by standardization of products he has increased production without increased number of employees. Another concern reports that slack periods have been reduced and output has been kept more uniform by the installation of a cost-accounting system, whereby a careful checking is possible on labor, materials, and stocks of castings in anticipation of needs. In this industry, as in numerous others, the importance of developing better methods of selling is recognized by the attention which a majority of the concerns are giving to these problems.

In this type of manufacture seasonal periods are the result mainly of general business conditions or of slack periods in certain major industries on which the market for products of this industry depends, rather than of inherent seasonal demands for foundry and machine-shop products. Some companies have added supplementary products to tide them over otherwise slack periods.

One manufacturer, whose former market was the textile industry, has adapted his equipment to make products used by other industries. The replies indicate a considerable amount of transition in this industry to new or modified types of products. The automobile has provided a new demand for certain lines of equipment and accessories. A company making engines attributes decreased sales to the increased use of electrical equipment operated from central power stations. A change in the type of prime mover has thus curtailed the amount of possible business. Purchased power and central heating plants are said by a manufacturer of steam regulators and other steam specialties to have decreased the market for these articles. A manufacturer of leather-working machinery finds his sales affected by changes in the market for leather manufactures, while a maker of tanning machinery reports decreased demand for his product resulting from the use of fabric and rubber as substitutes for leather. A company making supplies for street railways attributes decreased sales to recent changes in modes of transportation.

INDEPENDENT FOUNDRIES

Aside from the foundries connected with machine-shop activities that are included in the foregoing discussion there is a considerable number of separate foundries making castings for sale. The greatest number of these are makers of gray-iron castings; a lesser number make steel castings, and some make castings of brass, bronze, and other metals, as well as iron and steel products.

Sixty-four foundries turning out castings as their sole or main product gave information regarding their manufacturing activities. Of these, 41 were classified as iron foundries, 5 as steel foundries, and 18 made castings of brass, bronze, and other metals, in addition to iron. The greater part of this foundry activity is concentrated in Massachusetts and Connecticut, but the returns include also plants in Maine, New Hampshire, Rhode Island, and Vermont. All the reporting steel foundries had come into operation within the last few years. Changes in management within the past 10 years were reported in 15 cases.

The size of business done by the 58 individual companies in this reporting group is indicated by the following figures: Nine companies with individual sales of less than $50,000; 15 firms with sales between $50,000 and $100,000; 20 between $100,000 and $250,000; 9 between $250,000 and $500,000; and 5 exceeding $500,000 but less than $1,000,000. As to the size of pay rolls of these 58 companies, whose aggregate was 3,177 wage earners, there were 20 concerns employing fewer than 25 workers each; 15 companies employing between 25 and 50 workers; 14 employing between 50 and 100; and 9 employing over 100. Thus, more than three-fifths of the companies represented in these reports had an individual pay roll of fewer than 50 wage earners. Three iron foundries in Connecticut each reported a single branch plant within New England.

PRODUCTS AND RAW MATERIALS

As reported by 64 companies in this group, there were 37 which made only a single product—castings—and 27 concerns which made supplementary products in addition. Among the supplementary or special products reported by iron foundries are sash and elevator weights, steel and composition castings, bronze tablets, chucks, and customwork. The important raw materials reported by the iron and steel foundries are pig iron, coke, sand, and scrap. Foundries making nonferrous castings report the purchase also of aluminum, brass, bronze, copper, tin, zinc, lead, white metal, and spelter in individual cases. Scrap is purchased in the local markets. The sources of coke are divided between New England and other sections. Most of the foundries state that their molding sand comes from sources outside New England. Miscellaneous supplies aside from those mentioned were obtained mainly from local markets.

SALES TRENDS

The trend of sales indicated by 56 companies which gave figures for the years 1921 to 1925 showed for the latest year an increase of 20 per cent over 1923 and of 33 per cent over 1924. Decreases in business were attributed by several concerns to high cost of labor and materials, competition with other regions, changes in nature of demand, and local business conditions. Individual concerns whose sales showed an increase attributed their growth to new sales methods, to extension of territory, to general conditions of railroads, to improved quality of castings, and to better general business conditions.

The principal market and the chief sources of competition were reported to be New England in almost every instance. Jobbing foundries have their market limited almost entirely to local trade. A few iron foundries reported sales and competition in the Middle Atlantic and East North Central States, with occasional sales in other sections. All the steel foundries sell their products in New England, finding some competition from the Middle Atlantic States. Sales within New England, as indicated by 57 concerns replying, represented 81 per cent of their aggregate business, which amounted to nearly $10,000,000. A few concerns reported less than half of their volume of business as arising within New England. The majority of the companies reported that their proportion of sales to the New England market is increasing.

Very little export business is indicated. A single iron foundry reported foreign sales, and the amount in this case was very slight.

Actual production, in terms of maximum capacity, as based on reports from 44 companies, in 1925 was 63.5 per cent of the maximum possible capacity. There were 10 companies reporting an increase in plant capacity since 1921 and two reporting reductions, while 36 plants reported no change.

DISTRIBUTION METHODS

Distribution methods of these foundries run generally parallel to those of the larger group of foundry and machine-shop products. Selling direct to the trade is the prevailing method; a few concerns sell through wholesale dealers.

Trade-marks and advertising.—Only a small portion of the reporting companies indicated the use of an identifying mark on their products. Advertising is generally confined to local mediums and to direct mail methods. One concern reported the use of personal solicitation and magazine advertising, and another depended entirely upon a business directory.

NEW ENGLAND MARKET FOR IRON AND STEEL

NOTE.—The section on the New England market for iron and steel was prepared by Edwin Bates, of the Domestic Commerce Division of the Bureau of Foreign and Domestic Commerce.

This analysis of the market for iron and steel in New England is based on a series of interviews with New England representatives of iron and steel concerns and with contractors and engineering organizations; also upon such published reports as are available.[2]

The extensive industrial development of New England, together with the fact that its iron and steel industry is limited, forms the basis for an extensive market for iron and steel products in the region. According to a survey made in 1923, and allowing 10 per cent for increased consumption since then, the New England States consume annually about 1,760,000 tons of iron and steel products for all purposes. Some of these products are in finished form, such as sheets, plates, wire, and bars, but there is a considerable tonnage purchased in the semimanufactured state, such as blooms, billets, and slabs. New England purchases also an important tonnage of pig iron to be converted into cast-iron products or into steel for local uses. A considerable volume of iron ore is transported to seaboard points to be converted for the manufacture of iron and steel.

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[2] Special assistance was given in the present report by Mr. Herbert P. Simonds, Boston representative of the Penton Publishing Co. A report on steel distribution in New England, prepared by Mr. Simonds, appeared in the Iron Trade Review for Feb. 22, 1923, pp. 581–585.

The demands of the New England market for various iron and steel products used in the industries of the region are first considered. The demands of the market for these materials in building and construction activities are discussed separately.

SHEET STEEL

The wide range of small metal manufacturers in New England makes an extensive market for steel sheets of various types. Following are some of the manufactured products in which sheets are consumed to a greater or less degree: Ice boxes, gas stoves, automobile bodies, optical case stock, range boilers, stove pipe, containers for maple sugar and sirup, electrical sheets, radio instruments, ventilating machinery, skylights, textile machinery, metal lockers and filing cases, ferrotype plate, culverts, billboards, window boxes, ash and oil cans, poultry supplies, paint cans and pails, vegetable, fruit, and other cans, office trays and furniture, car roofs and metal ceilings, railway lanterns, and hot-water bottles. The present annual consumption of sheets in New England for these purposes is estimated at 188,500 tons.

Under the heading of sheets are included blue annealed sheets, tin plate, galvanized sheets, and black sheets. Sheets are defined as being less than one-eighth of an inch in thickness; all products exceeding this thickness are classed as plates. The heavy-machinery industries of New England require the blue annealed sheets rather than the black sheets; according to members of the trade, the market for blue annealed sheets is greatly on the increase. In the estimate of tonnage for 1923, blue annealed sheets accounted for 66,000 tons; tin plate, 55,400 tons; galvanized sheets, 38,000 tons; and black sheets, 12,000 tons.

The market for galvanized steel roofing in New England has shown practically no increase during recent years. This has been attributed largely to the rather stationary condition of New England agriculture, but partly, also, to the fact that steel has to be shipped in from outside sources. Some members of the trade feel that less sales pressure has been exerted in the sale of galvanized roofing in the New England States than in some other sections—for example, Ohio and Pennsylvania.

STEEL PLATES

The total annual consumption of steel plates in New England is estimated to be about 60,500 tons. Of this amount from 27,500 to 33,000 tons are used for structural purposes, and a similar amount is estimated to be consumed in shipbuilding, in gas and water works, and in locomotive and car repairing. New England at the present time thus offers a limited market for steel plates. During the war, when the shipbuilding industry was at its height, there was a heavy consumption of plates, but in recent years this has been limited largely to companies manufacturing boilers and automobile parts, and to water and gas companies. The chief national consumption of plates is in the manufacture of locomotives and railway cars, in which New England presents practically no market except the demand for repair purposes.

WIRE PRODUCTS

It is difficult to get an estimate of the New England consumption of wire products, because this section is a producer of these products from wire rods, as well as a direct producer of such final products as nails and fencing. It is estimated that upward of 250,000 tons of wire rods are either produced in New England or shipped in from outside mills. To this figure should be added a further item of 80,000 tons to cover the amount of finished wire and finished wire products manufactured outside and shipped into New England. Of the consumption of wire products nails are believed to account for approximately 82,500 tons and fencing and poultry netting together about 7,700 tons. There is also an important production of nails in the New England States, the principal producing plant having an annual capacity of 200,000 kegs. In addition to the consumption of wire rods in the manufacture of nails and wire, some are used in the manufacture of gratings and handles for tools. This brings the grand total for all wire products consumed in New England to upward of 340,000 tons.

SEAMLESS STEEL TUBING

Steel tubing finds its principal uses in steam boilers and in the manufacture of bicycles, motor cycles, and metal furniture. Consumption of steel tubing in New England is estimated at 5,000 tons annually. This estimate is based largely upon the number of registered steam boilers in the New England States. One of the principal factors affecting the market for boiler tubing has been the decreased use of steam power and an accompanying increase in the use of electric power. Changes in boiler products in recent years also have increased the utilization of boiler tubes and have extended the period of their use. Besides this, the practice has developed of employing used boiler tubes for other tubing purposes.

STEEL BARS

The annual New England consumption of steel bars is estimated at 582,000 tons, in addition to some 70,000 tons used for reinforcing steel. In the industrial consumption cold-drawn bars are estimated to amount to 100,000 tons, and special machinery bars with high manganese or carbon content, at 16,500 tons; while the consumption of alloy steel for tool steel and for electric and steel crucible bars is estimated at 25,500 tons annually.

The principal demand is in the class of commercial soft-steel bars, whose consumption is estimated at 440,000 tons a year. A careful check of the principal consumers in the six New England States showed the following distribution of soft-steel bar consumption: Twenty-nine consumers in Connecticut use annually 230,000 tons; 35

in Massachusetts, 192,000 tons; 14 in Rhode Island, 36,000 tons; 19 in Maine, New Hampshire, and Vermont, together, 45,000 tons, making a total of 503,000 tons, which, after allowing for duplications and possible exaggeration, is reduced to 440,000. The total annual consumption for all classes of bars, except in reinforcing steel, is thus estimated at 582,000 tons.

BLOOMS, BILLETS, AND SLABS

Shipments of blooms, billets, and slabs into New England are estimated not to exceed 33,000 tons annually. This tonnage, however, is converted into such products as wire, nails, and bars, and is accounted for under those headings. Shipments for the manufacture of nails and bars are principally in the form of wire bar, which is drawn and manufactured into the finished product in the New England factories. Imports of steel billets in 1926 amounted to nearly 3,000 tons, which were almost entirely absorbed by rolling mills at Portland, Me.

PIG IRON

The consumption of pig iron in the New England district is estimated to exceed 630,000 tons annually.[3] This consumption is distributed over a wide range of metal manufactures. Its principal outlet is in the production of textile machinery, which is estimated to require from 95,000 to 120,000 tons annually. Pipe and pipe fittings and valves occupy second place; electrical machinery is estimated to stand third; and stoves and radiators are fourth and fifth, respectively. Other important products into which pig iron enters, in the order of estimated importance, are as follows: Machine tools, hardware, gasoline engines, Diesel engines, scales, shoe machinery, gasoline pumps, and railway castings.

Considerable change has taken place in recent years in the sources of New England pig iron. Previous to the war the sources of pig iron for the New England market were fairly well distributed among four producing centers. The Birmingham district, Virginia, eastern Pennsylvania, and the Buffalo district, under freight rates and prices then prevailing, were competitors in New England consuming territory. Very little pig iron is now purchased from the Virginia and Birmingham districts, not over 25,000 tons coming from these two districts combined in 1925. Eastern Pennsylvania and Buffalo now supply the bulk of the tonnage from domestic sources. It was estimated that in 1925 not over 10,000 tons of the New England consumption originated in the Pittsburgh district. The Buffalo district, including some furnaces in western Pennsylvania, supplied in that year about 180,000 tons. Eastern Pennsylvania furnaces, now supplying 60,000 tons, are finding it increasingly difficult under developing competition to maintain their position in the New England market.[4]

Receipts of foreign pig iron have become a matter of importance. In 1925 the New England market absorbed 124,352 long tons of imported pig iron out of a total importation of 441,425 tons for the entire country, thus taking more than one-fourth of the total pig-iron imports. Imported pig iron has presented competition chiefly at Atlantic seaboard points.

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[3] See Iron Trade Review, July 8, 1926, pp. 80–82.

[4] See Kreutzer, E. C., Competition is Barring Eastern Pennsylvania Furnaces, in Iron Trade Review July 8, 1926, p. 82.

The Massachusetts customs district receives almost all the foreign pig iron entering the New England States. The sources of pig iron imported into the Massachusetts Customs District in 1926 were as follows, in tons of 2,240 pounds:

Germany	28, 531
Netherlands	21, 116
British India	8, 759
United Kingdom	5, 600
France	2, 500
Belgium	650
Sweden	40
Total	67, 196

The interesting developments in the New England trade in pig iron during the past few years include the construction of furnaces at Troy, N. Y., primarily for supplying the New England market, and the completion of the Mystic Iron Works, at Everett, Mass. These furnaces combined are capable of furnishing annually, for the New England trade, 350,000 tons or more and thus supply a large percentage of the New England demand for pig iron. The development of these furnaces marks a significant step that promises to have an important influence on the extended use of pig iron in the New England market.

IRON ORE

Pig-iron production at Everett, Mass., started in September, 1926. The plant of the Mystic Iron Works has a capacity of about 190,000 tons of pig iron a year, requiring over 350,000 tons of iron ore. The location of this plant at seaboard, with the advantage of cheap water transportation in securing its ore supply, provides competition for imported pig iron in the highly industrialized portion of New England. Of the total requirements of iron ore for this plant, a substantial portion is supplied from the Adirondack section of New York State.

During 1926 this plant imported from foreign countries 179,296 long tons of iron ore, the bulk of which came from Newfoundland. The following table shows the origin of foreign iron ore imported for consumption at Everett in 1926 (in tons of 2,240 pounds):

Newfoundland	108, 834
Algeria	54, 990
Sweden	14, 937
Germany	535
Total	179, 296

Pig-iron production at Everett is in the nature of a by-product from gas production. The furnace at Everett utilizes the coke by-product from the ovens of the extensive gas plants at that point. The combination of location at seaboard for utilizing imported pig iron and the use of the by-products of the gas plant provide favorable conditions for competition with the imported pig iron in the New England market.

IRON AND STEEL USED IN NEW ENGLAND CONSTRUCTION

The foregoing section has dealt with the market for iron and steel products that are used mainly in the manufacturing industries of New England. In the present section attention is given to the market for iron and steel products that are used mainly in construction activities. The principal forms of these are structural steel, reinforcing steel for concrete construction, iron and steel pipe, and steel rails and switch materials for railroad uses.

Structural steel.—The structural-steel requirements of the New England States are estimated to be about 200,000 tons annually. This includes structural shapes fabricated by shops in New England and also fabricated material shipped direct to contractors and builders. Of the total consumption, it is estimated that Greater Boston consumes annually 40,000 tons.

Bridge contracts frequently form an important part of the consumption of structural steel. Railways of this section are important users of steel for bridges and trestles, and their requirements in this market have been found more or less regular from year to year. Public highway bridges are important in some years, and in most instances these require steel over a period of several months following the time a contract is awarded.

The capacity of the structural-steel fabricating plants in New England is estimated by the trade at 90,000 tons annually. During recent years the actual output of these plants has probably been between 60,000 and 75,000 tons. No estimates are available regarding the volume of shipment of steel shapes into the New England market by outside fabricating firms. A few companies which specialize in the fabricating of steel shapes for certain types of factory buildings perform the fabricating at their plants in Ohio or Pennsylvania. The bulk of New England buying of structural steel is from producers in the Pittsburgh district and in eastern Pennsylvania.

Competition with foreign producers is encountered at seaboard points, where cheap water transportation favors the foreign product. The imports are mostly in the smaller items, such as angles, channels, and small bars. During 1926 imports of structural shapes and building forms into the New England market from other countries increased heavily, a total of 7,895 gross tons being purchased from abroad. Although this was a heavy increase over the previous year, and amounted to more than ten times the imports of structural shapes in 1924, it represented only about 5 per cent of New England's consumption of this class of steel products. The bulk of the 1926 importation was concentrated in the Massachusetts customs district, and, so far as could be learned in the trade, was largely absorbed in the metropolitan Boston district. Special inquiries developed the information that the large fabricating plants in New England do not import foreign steel, and that the imports are taken by iron and steel warehouses. Analysis of the monthly reports of the Massachusetts customs district in 1926 shows the countries of origin of structural steel for that district to be as follows:

	Pounds
Belgium	8, 736, 076
Germany	6, 857, 128
Netherlands	186, 397
United Kingdom	10, 475
Total	15, 790, 076

Figures are not available covering the seasonal movement of structural steel into the New England States, but the seasonality is not thought to be so pronounced as the movement of other classes of building materials. Structural steel can be worked at any time of the year, and winter weather does not measurably affect the erection of steel frameworks. This point has been repeatedly emphasized by structural steel contractors in New England, as well as throughout the country. One of the difficulties of equalizing the use of structural steel throughout the year, however, lies in the prevailing practice of deferring the taking out of building permits and the awarding of contracts until the spring months.

Reinforcing steel.—The demand for reinforcing steel depends upon the extent of reinforced concrete construction. This type is important not only in the construction of buildings but also in laying down streets and highways. One of the difficulties in obtaining estimates of consumption of reinforced steel lies in the definition of the item itself. If steel mesh is included along with reinforcing bars, the tonnage is appreciably greater. Estimates in the trade relative to the tonnage of reinforcing steel vary quite widely. It appears, however, that the consumption of the New England market for all types of reinforcing steel amounts to about 70,000 tons annually.

In recent years the demand for reinforcing steel in New England has shifted from industrial buildings to educational buildings and to automobile showrooms and garages. In the city of Boston, for example, members of the trade have estimated that public garage space sufficient for storing 30,000 automobiles has been constructed during the past five years. This is a type of building which lends itself particularly to reinforced-concrete construction.

There has been a considerable demand for reinforcing steel also in the construction of apartment houses of three and four stories, and of small hotels. Previous to the war and during the war period, according to members of the trade, the demand for reinforcing steel was largely for industrial buildings, but the future demand from buildings of this nature in New England is not expected to be large.

The bulk of the New England demand for reinforcing steel is in the States of Massachusetts, Rhode Island, and Connecticut, where State highway construction and building activity have been most concentrated. Special effort was made to obtain an estimate of the amount of reinforcing steel used in State highway construction in New England. From replies to letters directed to the State highway departments the following table, showing the consumption of reinforcing steel, has been developed.

Reinforcing Steel Tonnage Used by New England Highways in 1925 and 1926

[Based upon reports from State highway departments]

State	1926	1925	State	1926	1925
	Tons [1]	*Tons* [1]		*Tons* [1]	*Tons* [1]
Maine	1,239	139	Rhode Island	520	445
New Hampshire	194	205	Connecticut	[2] 4,000	[2] 3,000
Vermont	650	325			
Massachusetts	2,041	2,324	Total	8,644	6,438

[1] Of 2,240 pounds.

[2] Estimated.

Street-construction requirements in reinforcing steel would probably raise these figures by 1,500 to 2,000 tons, making the total estimated requirements for street and highway reinforcing in the neighborhood of 10,000 long tons. On the basis of 2,700,497 square yards of concrete construction in New England, as reported for the year 1926 by the Portland Cement Association, this seems a fair estimate of the market demand for this purpose.

The market for reinforcing steel is supplied not only by American producers but to a certain degree by foreign manufacturers. Belgian reinforcing steel is concentrated principally at seaport cities, where the product can be delivered advantageously by the foreign producer because of relatively low ocean transportation rates. During 1926 the foreign producer enjoyed a differential at seaboard points of $8 to $10 per ton. Higher freight rates to interior cities greatly limit the area of competition of the foreign manufacturer.

Iron and steel pipe.—The principal items to be considered under the heading of pipe for uses in construction are cast-iron pressure pipe for gas and water, wrought-iron pipe, and steel pipe. The combined annual consumption of these products by the New England market amounts to between 200,000 and 225,000 gross tons. Each of these types is analyzed separately.

Cast-iron pipe.—According to the estimates made by the trade, the New England market consumes about 100,000 tons of cast-iron pipe annually. Of this amount it is estimated that probably 40,000 tons are used for gas lines and 60,000 tons for water lines.

In New England, as in other parts of the country, the market for cast-iron pipe is determined largely by city growth. Very little pipe is sold for replacement purposes, as its life extends over several decades. The principal opportunity for selling cast-iron pipe comes from special appeals to towns which have no public waterworks system. As the cities and towns of New England have already reached a high degree of development in their water and gas systems, there is little occasion for new expansion, and this is an important factor in limiting the market for this product.

The New England market is supplied with cast-iron pipe principally from four manufacturers, all located in Pennsylvania and New Jersey. Only in special instances have southern manufacturers been able to obtain contracts in this market in competition with the northern producers; likewise the New Jersey and Pennsylvania producers have seldom been able to sell farther south than the State of Virginia. There is little competition in the New England market from producers located in the Pittsburgh section.

The radius of competition of pipe manufacturers is practically fixed by prevailing freight rates. The freight rate to New England points on cast iron from New Jersey and eastern Pennsylvania is about $5 per ton on a carload commodity basis, while the freight rate from Birmingham to the New England market is more than $10 per ton; it is still higher to points in eastern and northern Maine. The recent establishment of a plant for making cast-iron pipe at Everett, Mass., adjacent to the Mystic Iron Works, is significant in providing an important local source of supply for the New England market.

Foreign competition in cast-iron pipe has made itself felt in New England, particularly at seaport cities, such as Boston. In this, as with other steel products, the foreign producer is favored by comparatively low ocean freight rates, which permit strong competition at seaboard points. Apparently there has been little use of the foreign product at inland points in New England, on account of prohibitive local freight rates.

French producers have made the strongest bid for the market. One of the difficulties, however, has been the inability of the French producer to supply a product which would meet city specifications. In most instances the French product has been too high in phosphorus, thus tending to make the pipe brittle. Another difficulty encountered by foreign producers is the fact that the public-works departments of the large cities, such as Boston, usually send two inspectors to a plant supplying pipe for use on public contracts, and the necessary supervision can not be given to foreign concerns.

Imports of cast-iron pipe into New England from foreign countries in 1926 amounted to 11,900 gross tons, of which 6,882 tons entered the Massachusetts customs district and 5,018 tons the Connecticut customs district. With the exception of some 300 tons imported from Czechoslovakia, the total import trade in this product was held by French producers. The principal shipments were received in the months of May, June, July, and August.

One of the circumstances encountered in the New England market for cast-iron pipe in connection with waterworks systems is the presence of a considerable amount of organic matter in the water. This fact has presented a real problem to New England municipalities, where it has been found that in a period of 25 years the incrustation of the pipe has sometimes reduced the capacity of the supply system by as much as 40 or 50 per cent. This problem, which, of course, has been encountered in other sections of the country, has led to the development of cement-lined pipe, which involves coating the inside of the pipe with a mixture of sand and cement. This treatment has been found effective in eliminating the tuberculation and incrustation. In the opinion of members of the trade, pipe suitable for this type of lining will probably find increasing favor in the New England States.

Figures on the seasonality of shipments of cast-iron pipe are of practically no service in showing the seasonality of use. The construction of water lines and gas lines usually begins in southern New England about April 1 and in northern New England about April

15. May and June are the most important months from a consumption standpoint, as many projects beginning in the spring are completed by July 1. The larger buyers usually place their orders during June for projects to be completed in the latter half of the year. October and November are usually months of low consumption. The slack season of the year in New England is between November and April 1.

Trade practices in the sale of cast-iron pipe have changed considerably since the war. Up to 1918 the producers experienced a considerable seasonal slump in their production between November 1 and April 1. It had been the practice to make shipments of cast-iron pipe as contracts required, and this meant a heavy shipping season and a rush of production during a period following the 1st of April. In recent years producers have offered inducements to large buyers to place their orders during the off season. As a result, a considerable amount of buying has taken place in January and February for delivery at seller's option, thus allowing plants to continue operation and to make shipments at their convenience.

As a result of obtaining off-season contracts with delivery at his option the manufacturer has been able to sell his product at $1 or more per ton below the price made necessary when carrying a stock at his plant and making shipments according to the execution of contracts. At the present time, according to members of the trade, 15 per cent of the sales of the entire year are made in December, 20 per cent in January, and 10 to 15 per cent in February.

Wrought-iron pipe.—Estimates made by the trade are to the effect that between 9,000 and 10,000 tons of wrought-iron pipe are consumed annually in New England. The number of companies supplying this kind of pipe is quite small, and, so far as can be learned, these companies are located in the Pittsburgh and eastern Pennsylvania districts.

Wrought-iron pipe is used principally in heating, ventilating, and plumbing, and finds its principal competition from cast-iron, copper, and brass pipe. At the present time the manufacturers of copper and brass pipe are presenting considerable competition throughout New England, largely because of the importance of the copper and brass industry in the lower Connecticut region. One of the effective sales arguments of the manufacturers of copper-lined pipe has been the fact that tubercles do not form on a copper surface.

The high percentage of organic matter in the water supply of New England cities has presented the same problem to producers of wrought-iron pipe as to the makers of cast-iron pipe. Increasing interest is shown in the use of cement-lined wrought-iron pipe. According to the testimony from New England representatives cement-lined pipe is giving very satisfactory results. The manufacturers of wrought-iron pipe at the present time are turning out, at a price only slightly higher than that for the regular product, a specially inspected product that is satisfactory for cement lining.

The higher cost of wrought-iron pipe for heating, ventilating, and plumbing is an important factor in its competition with cast-iron and steel pipe. During 1926, when wrought-iron pipe was selling at approximately $150 per ton, steel pipe could be supplied on the job at about $70 per ton. These prices, however, are not strictly comparable, for the reason that a given length of cast-iron will weigh considerably more than an equal length of the wrought-iron or steel product.

Representatives of the manufacturers of wrought-iron pipe stress the fact that the relatively stationary population of New England cities has had considerable effect in limiting the market for their product. In the development of additions to a city the sale of sewer pipe and water pipe comes first; the demand for plumbing, heating, and ventilating equipment follows over a period of several months or years. Sales in New England come largely from replacements of worn-out pipe in homes and from construction of new residences within the present confines of the cities.

Steel pipe.—The annual requirements of the New England market for steel pipe are estimated by the trade to be about 100,000 tons. Steel pipe enters into competition with wrought-iron and cast-iron pipe in heating and plumbing and with vitrified-clay pipe for sewer construction. One of the limitations on the use of steel pipe for waste disposal in New England is the rather high acid content of the factory waste in a number of industrial centers. Imports of steel pipe into New England have been negligible.

Steel rails, frog and switch material.—According to an analysis of the New England market for rails and fastenings, between 110,000 and 115,000 tons of these materials are used annually.[5]

The requirements of the individual New England railroads for rails are estimated to average approximately as follows:

	Tons
Central Vermont	2,000
New York, New Haven & Hartford	40,000
Boston & Maine	25,000
Boston & Albany	8,000
Maine Central	8,000
Bangor & Aroostock	2,000
Rutland	2,000
Total	87,000

To these figurese for rails should be added about 4,800 tons for bolts and tie plates, on the basis of 5½ per cent of the tonnage of rails for these materials. Frog and switch materials are estimated to average about 4,500 tons annually, bringing the total consumption by steam railroads up to 96,300 tons. The New England street railways are estimated to use each year from 10,000 to 12,000 tons of girder rails, and from 5,000 to 7,000 tons of tee rails, making their total rail consumption about 17,000 tons, in addition to 500 tons of material for track fastenings; the total annual street railway consumption thus being in the neighborhood of 17,500 tons. The total consumption of rails and frog and switch materials by the steam and electric railroads of New England is thus in the neighborhood of approximately 113,800 tons a year.

SUMMARY OF IMPORT TRADE IN IRON AND STEEL

In addition to the heavy purchases of iron and steel from domestic sources by the New England market, an appreciable tonnage is imported annually from foreign countries. In the three years 1924 to 1926, inclusive, the imports of iron and steel into New England ranged between 10,000 and 50,000 long tons annually. The bulk of the tonnage in each year, however, was represented by the lower-value items, such as iron ore, pig iron, and iron and steel scrap. At the New England seaboard, American steel producers meet competition from foreign manufacturers, and in some items this competition is rather keenly felt. It is localized, however, at port cities, such as Boston and Providence, and because of comparatively high local freight rates it is prevented from becoming effective over a very wide area.

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[5] Iron Trade Review, Feb. 22, 1923, pp. 581–82.

MERCHANDISING OF IRON AND STEEL

The New England requirements for iron and steel are supplied through a number of merchandising channels—by shipments direct from manufacturers outside the New England States, by manufacturers within the region, by warehouses operating from outside the region, and by warehouses operated at various points in New England. Some of these warehouses are operated by iron and steel manufacturers and others by special iron and steel jobbers.

A large part of the tonnage of iron and steel is shipped in carload lots to the New England market from producers direct to consumers. Most of the consumers who buy regularly from month to month are in a position to make carload purchases, and special contracts for supplying structural steel for bridges and large buildings are made on a car-lot basis.

The warehouse operated by the iron and steel manufacturer or by an independent jobber is largely in the nature of a convenience unit for the distribution of products. Frequently a large fabricating plant which finds itself in need of one or more special items obtains its requirements direct from the nearest warehouse. In the main, however, such an organization depends upon direct shipments from the manufacturer. The warehouse is a regular source of supply for small contractors in structural steel and in cast and wrought-iron pipe for plumbing and heating and ventilating. As a carload of heating and plumbing supplies constitutes an outlay of some $3,000, few of the heating and plumbing contractors desire to carry so large an investment. They come directly, therefore, to the warehouse to fill their orders. In accordance with trade custom they are given a discount from the regular price at which the same product would be sold to the consumer.

In addition to the warehouses maintained by independent jobbers, iron and steel manufacturers operate warehouses for the purpose of supplementing the jobbers' stocks. In a number of slow-moving lines which the independent jobber hesitates to carry, the manufacturer frequently maintains stocks for the convenience of the trade; various examples cited by manufacturers' representatives showed that orders filled by them had reduced unnecessary delays by supplying direct from their warehouses. On a number of these slow-moving lines the manufacturer's warehouse secured a turnover of from two times to two and a half times a year.

Estimates made by manufacturers' representatives indicated that the warehouse business in New England usually comprises not more than 20 to 25 per cent of their annual sales, and in some sections the percentage is probably very much less than this. Warehouses maintained at points such as Boston are able to supply a considerable amount of the local metropolitan market without heavy additional expense for transportation, while the supplying of such inland points as Springfield and Worcester requires payment of a heavy transportation charge either by truck or by rail.

Most of the manufacturers of iron and steel maintain representatives in Boston, some of them serving only as selling offices and others operating warehouses in connection with their selling offices. The most of these include the entire New England States in the territory of the Boston office. A few, however, do not include the State of Connecticut in the Boston territory but handle the trade of this State through their New York office. In most instances the Boston office is independent of other offices, but in one or two cases it operates as a branch of the company's headquarters in New York.

HARDWARE GROUP

HARDWARE

The manufacture of hardware ranks among the first 12 industries of New England in its contribution to the region's income, and in Connecticut it is among the three leading industries of the State. Connecticut contributes about 95 per cent of the total New England production. In three States—Connecticut, Massachusetts, and Rhode Island—the hardware industry in 1927 added about $49,000,000 to the New England manufacturing income, with a total gross output valued at $71,435,000. It provided a market for materials, including fuel, power, and supplies, of upward of $22,500,000. There were 92 establishments in the three States. The industry in New England provided employment for upward of 19,000 wage earners, who were paid about $23,300,000 in wages. (See fig. 37.)

Outside New England the principal producing States, in the order of their contribution in 1925 to the total national income from hardware manufacture, were as follows: Illinois, $19,727,000; Michigan, $17,455,000; Pennsylvania, $14,486,000; New York, $11,567,000; Ohio, $10,564,000; New Jersey, $4,516,000. Three other States—Wisconsin, Missouri, and Iowa—contributed upward of $1,000,000 each, and Indiana, about $800,000. As a source of income from this industry, New England contributed nearly as much as Illinois, Michigan, Pennsylvania, and New York combined.

The New England income from the hardware industry in 1925 was approximately three times what it was in 1914, as shown by the value added by manufacture, in comparison with an increase of one-third in the 10-year interval from 1904 to 1914. These increases are somewhat below the expansion for the United States as a whole, in consequence of a relatively greater expansion in other parts of the country. In 1904 Connecticut produced one-half the hardware of the entire country; in 1914 its proportion was 39.3 per cent, and in 1925 it was approximately 37 per cent. The industry in this State, however, has shown very substantial and regular growth, the number of workmen employed increasing from about 15,500 in 1904 to 19,000 in 1914, and to more than 21,500 in 1925. The State's manufacturing income from the hardware industry more than tripled from 1914 to 1925.

From 1925 to 1927 this industry in New England experienced a definite reduction in activity, although little change appears in the total number of manufacturing establishments. The statistics for the individual States for these two years are shown in the following table, with comparative figures for Connecticut in 1914 and 1904.

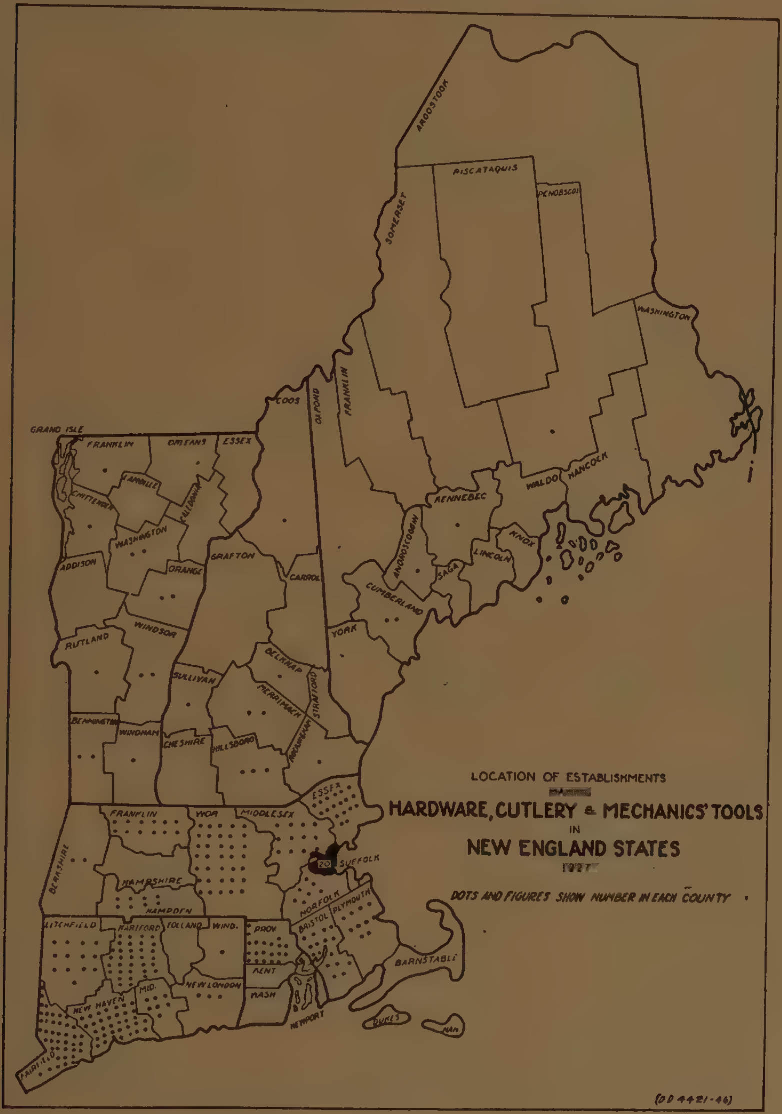
LOCATION OF ESTABLISHMENTS
[redacted]
HARDWARE, CUTLERY & MECHANICS' TOOLS
IN
NEW ENGLAND STATES
1927
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
KENNEBEC
WALDO
HANCOCK
KNOX
LINCOLN
SAGA
ANDROSCOGGIN
CUMBERLAND
YORK
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ROCKINGHAM
ESSEX
FRANKLIN
WOR
MIDDLESEX
BERKSHIRE
20
SUFFOLK
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV
KENT
WASH
MID.
NEW LONDON
NEW HAVEN
FAIRFIELD
NEWPORT
BARNSTABLE
DUKES
NAN
(OD 4421-46)

Figure 37

MANUFACTURE OF HARDWARE IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	57	18, 201	22, 299	21, 174	68, 013	46, 839
1925	64	21, 565	26, 338	23, 767	83, 026	59, 259
Massachusetts:						
1927	29	731	926	1, 183	3, 080	1, 897
1925	27	798	1, 027	1, 499	3, 958	2, 459
Rhode Island:						
1927	6	55	74, 193	178	343	165
1925	5	61	43	118	257	139
Total:						
1927	92	19, 079	23, 299	22, 535	71, 436	48, 901
1925 [1]	96	22, 424	27, 366	25, 384	87, 240	61, 856
Connecticut:						
1914	68	19, 004	10, 230	10, 226	28, 808	18, 783
1904	75	15, 488	7, 323	7, 528	21, 481	13, 953
United States total:						
1927	485	47, 834	60, 827	71, 877	208, 254	136, 377
1925	476	52, 349	65, 567	77, 503	225, 053	147, 550
New England as per cent of United States, 1925	20. 2	42. 8	41. 7	32. 8	38. 8	41. 9

[1] Not including 3 establishments in New Hampshire, 2 in Maine, 2 in Vermont.

EXPERIENCES OF MANUFACTURERS

Replies were received from 37 establishments regarding their manufacturing and selling practices, and of this number 33 companies had aggregate sales in 1925 of nearly $44,000,000, their combined output representing more than 50 per cent of the total industry in New England. The replies were well distributed, with Connecticut represented by 19, Massachusetts by 14, New Hampshire by 2, and Maine and Rhode Island by 1 each. The group includes establishments making a wide variety of products of which the following are typical: Automobile, coach, and carriage hardware; builders' and cabinet hardware; casket, furniture, trunk, and suitcase hardware; marine, car, and railway hardware; kitchen and household hardware; piano and organ hardware; locks and keys; and miscellaneous products.

Raw materials.—The principal raw materials reported by these companies are steel, iron, and brass. A few reported, also, silver, copper, wood, and other supplementary materials. The majority of the manufacturers stated that they purchase steel and brass within New England, but purchases of iron are about evenly divided between New England and outside sources.

Size of establishments.—The reporting group includes companies whose annual sales volume ranged from $15,000 a year to upward of $20,000,000. There were 10 companies with individual sales of less than $100,000; 12 between $100,000 and $500,000; 5 between $500,000 and $1,000,000; and 6 large concerns exceeding $1,000,000, 1 of which had sales of more than $20,000,000.

The aggregate pay roll of 36 reporting concerns was 11,322 workmen. Approximately half of these concerns employed fewer than 50 workmen each, and half of them more than 50. There were 17 companies employing below 50, of which 12 reported fewer than 25 on their pay roll; 8 companies employing between 50 and 100; 4 between 100 and 250; and 7 employing more than 250 workmen; the latter included 1 company with a pay roll exceeding 1,000, another exceeding 2,000, and 1 employing more than 5,000 workmen.

Plant practices.—Use of incentive methods of wage payment was reported by two-thirds of the replying companies; one-third of them stated that no incentive methods were used. The great variety of styles, sizes, and types of product made by hardware plants presents difficulties in the application of such incentive plans. It is evident, however, that New England hardware manufacturers in general have made progress in this respect. For the 23 companies reporting the use of wage incentives, 55 per cent of their aggregate number of employees were so paid.

Seasonal employment is not so pronounced in this industry as in some other lines. A substantial number of the firms reported efforts to overcome seasonal fluctuations in activity by the addition of supplementary products to their main line or by manufacturing for stock during otherwise dull periods. For example, a concern making awning hardware supplemented this line with the manufacture of pipe fittings. A concern making marine hardware states: "We have been adding to our line everything in marine goods for which we can find a market." A manufacturer of gocart and velocipede hardware reports the addition of a line of velocipedes and gocarts. Many other examples of similar nature were given, showing a tendency to overcome seasonal activity by supplementary products.

Age of establishments.—The manufacture of hardware is one of the older industries of New England. The average period of operation of the 37 reporting plants was 41 years. Eleven of these had been in operation for more than half a century; 20 of them between 10 and 50 years; while 6 companies had been in operation not more than 10 years. Changes of management within the last 10 years were reported in nine instances.

Reasons for location.—Reasons for locating plants in New England, as indicated in the replies, are quite varied, labor conditions being given by the largest number of concerns. Nearness of markets has been an important consideration with many concerns making hardware specialties for use by other manufacturers. This applies particularly to the smaller establishments. For example, one concern making piano hardware sells the most of its product to local piano manufacturers. One of the largest concerns in Connecticut states that labor conditions constituted the sole reason for starting and continuing in this section. The industry, which was started many years ago by local men, has, during the intervening years, built up a skilled-labor market which has attracted other concerns.

Branch plants.—Branch plants were reported in only a few instances. One of these was a Connecticut maker of casket hardware, which has a branch in Boston, and the other a very large manufacturer of builders' hardware, which has a branch plant in an Ohio city. A prominent Connecticut company has established a western branch, stating as the main reason its inability to compete on a tonnage basis in New England because of freight rates. This concern states that it is possible to maintain its position in New England on high quality and high-priced goods requiring highly skilled workmen, where freight is an insignificant item, whereas on heavier products freight is a deciding factor.

Operating ratio.—Additions to plant capacity since 1921 were reported in nine instances. These are mostly increases of from 10 to 25 per cent, but three concerns doubled their capacity and one of the largest companies making builders' hardware reports a 50 per cent addition. The ratio of output in 1925 to the maximum capacity was, in most cases, from 75 to 85 per cent. The weighted average for 30 concerns giving figures was 78 per cent of maximum capacity. Twenty-one concerns reported operations at upward of 75 per cent of the maximum, and 10 others had between 50 and 75 per cent.

Sales trends.—The general sales trend for the reporting group has been decidedly upward since 1921. Figures from 32 companies show an increase of 71 per cent in aggregate volume of sales from 1921 to 1925. The greatest increase took place in 1923 and this was followed by a slight decline in 1924, with full recovery in the following year, so that there was a slight net increase from 1923 to 1925. In this latter 2-year interval there were 18 concerns whose individual sales increased and 13 whose sales decreased. Analysis of the individual sales figures shows that the increases in this period were more frequent among the larger companies, while the smaller companies experienced the greater number of sales reductions.

The general reasons assigned for increased sales volume were lower manufacturing costs, which have been a factor in reducing selling prices; new sales methods, which have resulted in an extension of markets; and new products. Increased building activity was also mentioned. Individual reasons given for decreased sales volume were competition from manufacturers in the West and in the South, reduction in the use of horses, and general business conditions.

Markets.—A majority of these companies find the principal market for their product outside New England. Ten companies reported that more than half of their sales were made within New England; 16 stated less than 25 per cent. Reports from 29 companies with aggregate sales of $40,000,000 show that approximately 20 per cent of the total sales were made to New England customers.

Export business was reported by 13 companies whose aggregate business was $15,000,000, the weighted average of exports for this group being approximately 5 per cent of total sales. The exports of individual companies ranged from 5 per cent to 15 per cent. One small concern reports exports of 50 per cent.

Methods of distribution.—The prevailing methods of distributing the product of hardware manufacturers, as shown by these replies, is through wholesale houses, with direct sales to manufacturing consumers as second in frequency. Twenty-two companies reported marketing their product through wholesalers, in many cases supplementing this channel with direct sales to retailers and other manufacturers. Ten companies of the total number reported sales direct to the retailer, and a small number rely upon selling agents for disposing of their product. The unweighted average of selling costs for the entire group was 10 per cent of the value of products in 1925.

Use of brands, trade-marks, and advertising.—Use of a private brand or trade-mark is generally prevalent in this industry, three-fourths of the reporting companies indicating this practice, though five small and medium-sized concerns stated that none of their products are trade-marked. Many of the companies, however, trade-mark their entire output. The proportion of trade-marked goods for 25 reporting companies was 87 per cent of their aggregate sales.

The use of advertising was reported by three-fourths of those reporting, but nine companies stated that they did no advertising at all. National mediums prevail, in which those most generally used are trade journals and direct mail. Advertising expenditures of the companies, giving figures, were approximately 2 per cent of the value of their products.

Improvements in manufacturing practice.—Improvements of various sorts in manufacturing practices are indicated by a large proportion of the reporting companies. The safeguarding of workers against accidents has received attention from the greatest number, while next in frequency is improvement in methods of controlling production and in internal organization. A considerable number of concerns report emphasis upon inspection methods and standardization of products. Comparatively few companies reported the employment of industrial research.

CUTLERY AND EDGE TOOLS

The cutlery and edge-tool industry includes plants that are engaged primarily in the manufacture of table and kitchen cutlery, pocket knives, putty knives, butchers' knives and implements, razors, scissors, pruning shears, clippers, axes, hatchets, chisels, and similar lines. It does not include silver-plated cutlery, which is classified with plated ware in another group. There were 67 establishments engaged in the manufacture of cutlery and edge tools in Massachusetts and Connecticut in 1927. Massachusetts leads considerably in the number of wage earners, and markedly in value of output and of revenue from manufacturing. This industry added to the manufacturing income of the two States in 1927 upward of $33,800,000, with products valued at more than $42,000,000. The industry employed approximately 6,000 wage earners who were paid in wages $7,334,000, and provided a market for materials, fuel, and supplies amounting to $8,330,000.

The total for this industry in the two States shows a material increase in value of output and in manufacturing income from 1925 to 1927, although there was a slight reduction in the total number of wage earners and in the total wages paid. In Connecticut there was a reduction in the number of establishments from 31 to 25, and a slight falling off in output and in income. In Massachusetts, however, there was an increase in establishments from 39 to 42, an increase of 210 wage earners and an increase of more than $1,000,000 in the manufacturing income.

The growth of this industry in New England since 1904 has slightly surpassed the growth for the country as a whole. The value added by manufacture in these two States almost quadrupled from 1914 to 1925. In the latter year their product was about 52 per cent of the total national output, in comparison with 46 per cent in 1914 and 49.5 per cent in 1904. The following table shows the activity in Massachusetts and Connecticut, both individually and collectively in 1927 and 1925, as well as the comparative figures for 1914 and 1904.

MANUFACTURE OF CUTLERY AND EDGE TOOLS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	42	3,407	4,174	5,883	33,705	27,822
1925	39	3,197	4,028	5,507	32,309	26,802
Connecticut:						
1927	25	2,585	3,160	2,447	8,431	5,984
1925	31	2,912	3,803	2,966	9,227	6,261
Total:						
1927	67	5,992	7,334	8,330	42,136	33,806
1925 [1]	70	6,109	7,831	8,473	41,536	33,064
Massachusetts, 1914	37	1,947	1,067	833	4,354	3,521
Connecticut, 1914	33	5,008	2,931	2,537	7,357	4,819
Total, 1914 [2]	70	6,955	3,998	3,370	11,711	8,340
Massachusetts, 1904	39	2,169	1,091	811	2,585	1,774
Connecticut, 1904	40	4,565	2,460	2,113	6,168	4,055
Total, 1904 [3]	79	6,734	3,551	2,924	8,753	5,829
United States total:						
1927	230	17,178	20,270	19,126	76,688	57,562
1925	211	16,407	20,226	20,562	80,263	59,701
Connecticut and Massachusetts as per cent of United States, 1925	33.2	37.2	38.7	41.2	51.7	55.4

[1] Not including 2 establishments in Rhode Island, 2 in New Hampshire, 1 in Maine.
[2] Not including 6 establishments in Maine, 5 in New Hampshire, 2 in Vermont, 1 in Rhode Island.
[3] Not including 9 establishments in Maine, 7 in New Hampshire.

A CROSS SECTION OF THE INDUSTRY

Thirty-nine manufacturers of cutlery and edge tools submitted replies to a special inquiry regarding their operating practices, and of this number there were 30 companies giving sales figures for 1925, aggregating $34,500,000, and representing more than 80 per cent of the total industry in New England. Nineteen of these companies were located in Massachusetts, 13 in Connecticut, 2 in Maine and New Hampshire, and 3 in Vermont. Included in this group of 30 companies were 15 with individual sales of less than $100,000, 14 between $400,000 and $500,000, 1 between $500,000 and $1,000,000, and 2 exceeding $1,000,000. In the latter was one company overshadowing all the others with a business considerably in excess of $25,000,000.

Size and age of establishments.—The size of 35 companies, as indicated by the average number of persons on their pay roll, was as follows: Nineteen employed fewer than 50 workers each, 7 between 50 and 100 workers, 7 between 100 and 250 workers, and 2 companies employed more than 500 workers, one of which had a pay roll of nearly 2,000 workers.

Of 31 companies reporting the length of time they had been in operation, 21 had been in business 50 years or more. There were 10 concerns that had been established within the last 10 years, and 14 companies reported changes in management within the last 10 years. Five concerns reported branch establishments, one of which was in a Middle Western State, while another had branches in Montreal and in England. Additions to plant capacity since 1921 were reported in 10 instances, and 1 company reported a reduction. Three companies stated that their capacity had been more than doubled, and 4 others had made increases of from 25 to 75 per cent in capacity.

The output, in terms of the maximum capacity for 26 companies, exclusive of the largest plant reporting, was 71.4 per cent. This largest concern reported operations exceeding the full single-shift capacity through the employment of night work. Rating this concern at 100 per cent brings the average output for the whole group to the high point of 92.3 per cent of the aggregate maximum capacity.

Raw materials.—The principal raw material reported was steel, used by practically every concern, with a smaller number using iron and several employing also silver, nickel, brass, wood handles, celluloid, and various other minor articles used in manufacture. In most cases it was said that steel and iron were purchased from sources outside New England.

Manufacturing practices.—A remarkably high proportion of employees of these reporting companies are paid by some incentive method of wage payment, such as piecework or a premium plan, the weighted average for 25 concerns giving data regarding this practice being 68 per cent of the aggregate pay roll. Only 4 of the 29 which made definite statements stated that they paid none of their employees by such methods. In this industry where labor costs absorb approximately 40 per cent of the value of the product, it thus appears that the development of incentive methods of wage payment has received a high degree of recognition.

Regarding the seasonal periods of activity in this industry, the average number of employees at quarterly intervals in 1923 and 1925 indicates a general period of slack employment in the late spring and summer months and a period of maximum activity in the fall. Relatively few of the companies report the development of supplementary products to overcome a seasonal tendency, but many of them maintain uniform employment by manufacturing goods for stock during dull periods. Improvements in manufacturing practice most frequently emphasized are in the line of factory inspection. One company states that the finer quality of finished knives, brought about by better inspection methods, has resulted in increased sales. Another states that production control has made possible an increase of at least 10 per cent in output. Various others indicate similar effects from improvements in recent years.

Sales trends.—The figures of sales show a decidedly upward trend in volume during the last few years, with a maximum reached in 1925 for 25 reporting concerns, amounting to an aggregate increase of 96 per cent over 1921. From 1923 to 1925 there were 15 concerns whose individual sales increased and 13 which decreased. An examination of the sales trends of individual companies discloses that it is the larger concerns whose sales have consistently increased, and that they attribute the increase, in most cases, to extension of sales territory and to an improvement of their selling methods.

Practically all the companies in this group reported that they distribute their products nationally and that a majority of their total sales are made outside New England. The weighted average of New England sales for 26 companies was slightly less than 10 per cent; only 6 concerns stated that the majority of their sales were made within New England. Exports were reported by 20 companies, the weighted average for the group being 35 per cent of their aggregate business. This includes two very large concerns, one of which had exports of 34 per cent and another of 85 per cent. Excluding these two from consideration, the average exports of the other 18 was 6 per cent of their aggregate sales.

Distribution methods.—The prevailing method of distribution reported is through wholesale dealers, but most of the companies market a portion of their product through other channels, of which sales direct to the retailer and to the manufacturing consumer were most frequent. Most of the companies reported reliance upon two or more distribution channels.

Use of trade-marks and advertising.—The use of trade-marks prevails generally in this line. Twenty-one of the companies indicated that a weighted average of 77 per cent of their aggregate output was marketed under an identifying brand name. Advertising also appears to be the prevailing practice, only four companies indicating that they did no advertising. National advertising predominates, through the medium of trade journals and direct mail.

MECHANICS' TOOLS

Small tools for the use of mechanics and machinists include such articles as expansion bits, taps, dies, gauges, drills, reamers, jigs and fixtures, chucks, micrometers, pipe cutting and threading tools, files and rasps, bit braces, broaching tools, hack-saw blades, carpenters' tools, and other small mechanical tools. Although this classification is distinct from other similar manufactures, many companies whose main product is machinery and machine tools turn out considerable quantities of these small tools in addition, either for their own use or for sale. Hence, the official figures for the small-tool industry do not represent the entire output.

According to the 1927 census this industry in four New England States (not including New Hampshire and Maine) provided a manufacturing income upward of $23,000,000 to this region, and the gross value of its products was upward of $33,000,000. The industry provided employment to an aggregate of 8,052 workers with a pay roll of upward of $10,000,000, and afforded a market for materials amounting to more than $10,000,000, including fuel, power, and supplies.

The making of small tools is concentrated in Massachusetts and Connecticut, although there are many important establishments in Rhode Island which turn out substantial quantities of these products in connection with the manufacture of machine-tool equipment. Massachusetts represents more than 60 per cent of the reported New

England total, and Connecticut about one-half as much as Massachusetts. The industry is of considerable importance to Vermont, adding to its manufacturing income in 1927 about $1,119,000.

This industry shows a very slight reduction in total activity in the New England States from 1925 to 1927. The number of establishments in Massachusetts, Connecticut, Vermont, and Rhode Island was reduced from 153 to 142, most of this reduction taking place in Massachusetts. There was a slight falling off also in the total number of wage earners, which took place principally in Massachusetts and was partially offset by increases in Connecticut. The total wage payments in these four States show a slight increase. There was a reduction of about $1,000,000 in the gross value of the output and a relative reduction in the net manufacturing income. In Vermont there was a slight increase in the value of the output but a slight reduction in the net manufacturing income, as shown by the value added by manufacture. The following table gives the census figures for the individual States for 1927 and 1925, together with comparable totals for 1914 and 1904.

MANUFACTURE OF MACHINISTS' AND MECHANICS' TOOLS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	72	4, 589	5, 838	5, 061	19, 113	14, 052
1925	82	4, 909	6, 139	5, 715	21, 206	15, 491
Connecticut:						
1927	49	2, 830	3, 734	4, 112	11, 586	7, 474
1925	49	2, 695	3, 306	3, 710	10, 472	6, 763
Vermont:						
1927	9	459	474	814	1, 933	1, 119
1925	8	449	475	688	1, 889	1, 201
Rhode Island:						
1927	12	174	248	126	521	395
1925	14	166	222	130	568	438
Total:						
1927	142	8, 052	10, 294	10, 113	33, 153	23, 040
1925[1]	153	8, 219	10, 142	10, 243	34, 135	23, 893
New England total:						
1914	185	7, 586	4, 588	4, 310	13, 650	9, 339
1904	162	4, 615	2, 497	2, 626	8, 317	5, 691
United States total:						
1927	657	25, 232	34, 465	37, 057	117, 431	80, 374
1925	663	25, 340	34, 294	39, 023	121, 263	82, 240
New England as per cent of United States:						
1925	23. 1	32. 4	29. 6	26. 2	28. 1	29. 1

[1] Not including 5 establishments in Maine, 4 in New Hampshire.

New England contributed in 1925 about 29 per cent of the United States total manufacturing income from this industry. Massachusetts surpassed any other State. Outside New England the leading State is Ohio, which is nearly as important as Massachusetts. Next in order are Illinois and Michigan, of approximately equal importance, each deriving upward of $9,000,000 in income from this source. These States are followed by Pennsylvania and New York, each of which contributes less than Connecticut, with individual State incomes exceeding $6,000,000. New Jersey follows, with less than $3,000,000, and Indiana and Iowa each contributed upward of $1,000,000.

Comparison of figures for New England with those for the entire United States shows that this group of States contributed more than 40 per cent of the total national income from this industry both in 1904 and in 1914, while its share in 1925 had fallen to 29 per cent. New England thus held its national position in the decade preceding 1914 but fell back materially after 1914 in consequence of great expansion in other sections of the country. This particular line of metal manufacture has thus shown a much more conservative growth in New England than the kindred lines of hardware and cutlery. The income from tool manufacture in New England increased about 150 per cent from 1914 to 1925, while that from hardware increased by nearly 200 per cent and that from cutlery nearly 300 per cent.

Comparison of figures for 1925 with those for 1914 and 1904 shows that in 1925 there was approximately the same number of establishments in New England as 20 years ago. The number of wage earners shows an increase of 80 per cent over 1904, while the value of product and the income from manufacture have more than quadrupled. As compared with 1914 there was in 1925 an increase of about 700 in the number of wage earners, while the value of product and the value added by manufacture increased one and one-half times.

EXPERIENCES OF SMALL TOOL MANUFACTURERS

Size and age of establishments.—A large group of manufacturers with aggregate sales of nearly $20,000,000, representing nearly 57 per cent of the whole industry in New England, submitted information regarding their operations. These concerns specialize in one or more of the products mentioned and range in size from plants with business of a few thousand dollars up to one company with annual sales exceeding $3,000,000. There were 77 replies in all, and 68 gave complete sales figures. Of this latter number, 51 reported individual sales of less than $250,000 each and 17 more than $250,000. There were 29 companies with sales of less than $50,000; 12 between $50,000 and $100,000; 10 between $100,000 and $250,000; 7 between $250,000 and $500,000; 5 between $500,000 and $1,000,000; and 5 exceeding $1,000,000 in sales.

The 17 companies with individual sales over $250,000 represented 85 per cent of the total sales for the 68, and the 5 companies with sales exceeding $1,000,000 made up 55 per cent of the total. The aggregate pay roll of 70 concerns giving figures was 4,511 workers. Fifty-eight companies had fewer than 100 workers each and 12 had more than 100. There were 44 whose pay roll was fewer than 25 and 5 with more than 250 each. The largest company employed 700 workers. The 12 largest companies accounted for 73 per cent of the total employment of the group.

The average age of 77 reporting plants was 23 years. There were 51 that had been established within the last 25 years, and 25 of these had started business within 10 years; 13 companies have been in continuous operation for more than 50 years. Changes in management within the last 10 years were reported by 22 concerns. Branch manufacturing plants were reported in operation by 8 of the 77 companies. One company reported a branch in Canada; another company, one in Missouri; and a third has a branch in Virginia; the other branches are located within New England.

Raw materials.—The principal raw materials purchased are steel and iron castings. A few companies reported also brass, wood for handles, grinding wheels, and other minor materials. The steel is purchased mainly from sources outside New England, but iron castings are bought principally from local sources.

Additions and operating ratio.—Additions to plant capacity since 1921 were indicated by 20 companies, the increases ranging from 10 per cent up to fivefold the original capacity. Six companies stated that their capacity had been doubled or more than doubled, and 5 others reported more than a 50 per cent increase. No reductions were stated. The degree of utilization of plant capacity, as shown by reports of 53 companies with aggregate sales of $14,600,000, is indicated by the weighted average of 71.5 per cent of maximum capacity. Thirty-five companies reported operations at 75 per cent or upward, while 8 others were operating at less than one-half the maximum capacity.

Plant practices.—Little seasonal tendency exists in this industry, according to the reports received. Employment is fairly uniform throughout the year and slack periods are due more to general business conditions than to seasonal influence. This regularity of employment is largely due to diversification in types of customers, partly to the practice of manufacturing for stock during otherwise slack periods, and partly to the development of supplementary products.

The use of incentive methods of wage payment was indicated by upward of one-third of the reporting companies, the weighted average for 22 concerns, giving data covering an employment of 3,450 workers, being 45 per cent. Two of the largest companies paid one-half of their entire pay roll on an incentive basis and 16 companies paid more than one-half in this way.

Sales trends.—The sales of these companies were, in general, decidedly upward since 1921, the aggregate for 53 concerns showing an increase of 69 per cent over this period. Practically all this increase took place, however, previous to 1924; the aggregate sales of 64 companies were only a fraction of a per cent greater in 1925 than in 1923. In the latter 2-year interval individual increases were shown by 34 firms and decreases by 26. The increases were relatively more numerous among the smaller concerns, and the decreases were more frequent among the companies exceeding $250,000. The latter decreases, however, were in most cases relatively slight in proportion to the individual volume of business.

Sales increases were attributed in individual replies to improved design of tools, improved workmanship, increased building, more automobiles, increase of syndicate stores, increased sales effort, and protective tariff. Decreases in sales volume were attributed in individual cases to "inability to get skilled labor at fair wages," the westward trend of business, demand for cheaper products, general overproduction, and competition from Germany.

Improvements reported.—Various improvements in manufacturing practices were reported by individual companies. One concern, which operates its factory only 5 days per week, 9 hours per day, stated that it had obtained an increase of 50 per cent in production per man employed. Another stated that manufacturing costs had been reduced considerably through standardization of products. A third reports a decided improvement from the installation of a new cost-accounting system. In another instance a manufacturer states that production control, adjusting plant capacity to demand, purchasing schedules, and standardization of products had resulted in a decrease of approximately 25 per cent in inventory investment and an increase from 1.1 to 2.2 per cent in turnover.

Location of markets.—Most of the output of manufacturers reporting in this line finds its market outside New England. The reports of 58 companies, with aggregate sales of $18,000,000, showed a weighted average of 15.7 per cent sold within New England. One large manufacturer of taps and dies, doing a $2,000,000 business, reported 25 per cent of his sales in New England. Another million-dollar company, making wrenches, stated that only 2 per cent of its business comes from New England. Most of the large companies reported from 10 to 20 per cent of their sales within the region. Of the whole group, 23 companies reported a majority of their sales to the New England market, while 19 concerns sold less than 10 per cent in that area. Increasing New England sales were reported by a greater number of concerns than those showing decreases.

Exports were reported by 27 companies, with aggregate sales exceeding $17,000,000. The weighted average of exports for this group was 14 per cent of their total sales. Fourteen companies reported exports ranging from 10 per cent to 25 per cent, 1 reported 30 per cent, and 12 less than 10 per cent. Several of the latter exported only 1 or 2 per cent of their total.

Methods of distribution.—The principal distribution channels are wholesale houses and direct sales to the consumer (manufacturer). Twenty-two companies stated that they market their entire product through wholesale houses, while an equal number use this channel in conjunction with others. Eighteen companies stated that they sell their entire output direct to the consuming manufacturer, while nearly as many others use this method in conjunction with other agencies. Only two manufacturers reported sole reliance on direct sales to retailer, although a number of companies market a portion of their product directly through retailers.

Use of trade-marks and advertising.—Identification of product with trade-mark or brand name is practically universal among these reporting companies, practically the entire product being sold under a brand name. All but eight of the reporting companies indicated the use of advertising. Most of them employ national mediums, in which the trade journal predominates, supplemented by dealer helps and direct mail. The average advertising costs for the group was relatively high, being 2.6 per cent of total sales.

BRASS, BRONZE, AND OTHER NONFERROUS METALS

The manufactures discussed in this section include products made from ingots and bars of brass, bronze, and other nonferrous alloys, and numerous products for remanufacture, as well as fully manufactured articles made principally from these materials. There is a wide variety of uses and types in this group. Copper enters into all the important products of this industry, being combined with zinc in brass manufacture and with tin in bronze. Brass has a great variety of uses because of the ease with which it can be cast and machined.

This industry represents 2 per cent of the total New England income from all manufacturing activity of the section; in Connecticut it comprises over 8 per cent of the State's manufacturing income, and ranks third in importance among all its manufactures.

This industry contributed about $60,000,000 to the revenue of New England in 1925, as shown by the value added by manufacture, and its products had a gross value of more than $170,000,000. There were nearly 26,000 persons engaged in this line, who received in wages and salaries over $39,000,000. The industry gave employment to nearly 23,000 wage earners and paid more than $31,000,000 in wages. It provided a market for various materials, including fuel, power, and supplies, amounting to $111,000,000.

IMPORTANCE IN NEW ENGLAND

More than 90 per cent of the national production of this industry is contributed collectively by New England, the Middle Atlantic States, and the East North Central States, in which New England surpasses slightly each of the other two sections. The importance of New England is indicated by a contribution of approximately one-third of the value of the total national production in this line. In this group of States were 36 per cent of all the wage earners of the United States in 1925 for this industry, and it contributed 35 per cent of the wages paid by the whole industry. The manufacturing income from this industry in New England in 1925 was 53 per cent of the national total and in 1914 it was 39 per cent. (See fig. 38.)

Connecticut contributes more than 90 per cent of the total activity for New England. This type of manufacture is among the three leading single industries of that State. The industry is concentrated largely in half a dozen manufacturing cities and towns in and adjacent to the Naugatuck Valley. The city of Waterbury in 1925 represented 53 per cent of the State total. Connecticut alone represents over 30 per cent of the total national production, while the other New England States have approximately 3 per cent. Outside New England the next important city in this line is Detroit, Mich.

Connecticut has continuously been the leading State of the Nation in this industry. In 1904 Connecticut contributed more than half (53 per cent) of the national value of products, and the State of New York then ranked second, with about 8 per cent. In 1909 Connecticut contributed 45 per cent of the national value of products and New York 15 per cent. In 1914 Connecticut's contribution was 43 per cent, while that of New York was still 15 per cent. In 1919 Connecticut represented 35 per cent and New York 14 per cent of the national value of products.

This New England industry shows a slight net increase from 1925 to 1927 in its contribution to the region's manufacturing income, although there was a considerable reduction in the gross value of the output and in outlay for materials, and a slight falling off in the number of wage earners and in wages paid. The total number of establishments was practically the same in the two years. There was approximately the same number of establishments in 1925 as in 1914, but there was substantial growth in number of wage earners—an increase since 1914 of more than 4,000 workers. The value of the products increased 125 per cent in this 11-year interval, and the region's revenue increased 229 per cent, in comparison with a national increase of 285 per cent. In the preceding decade there was a slight

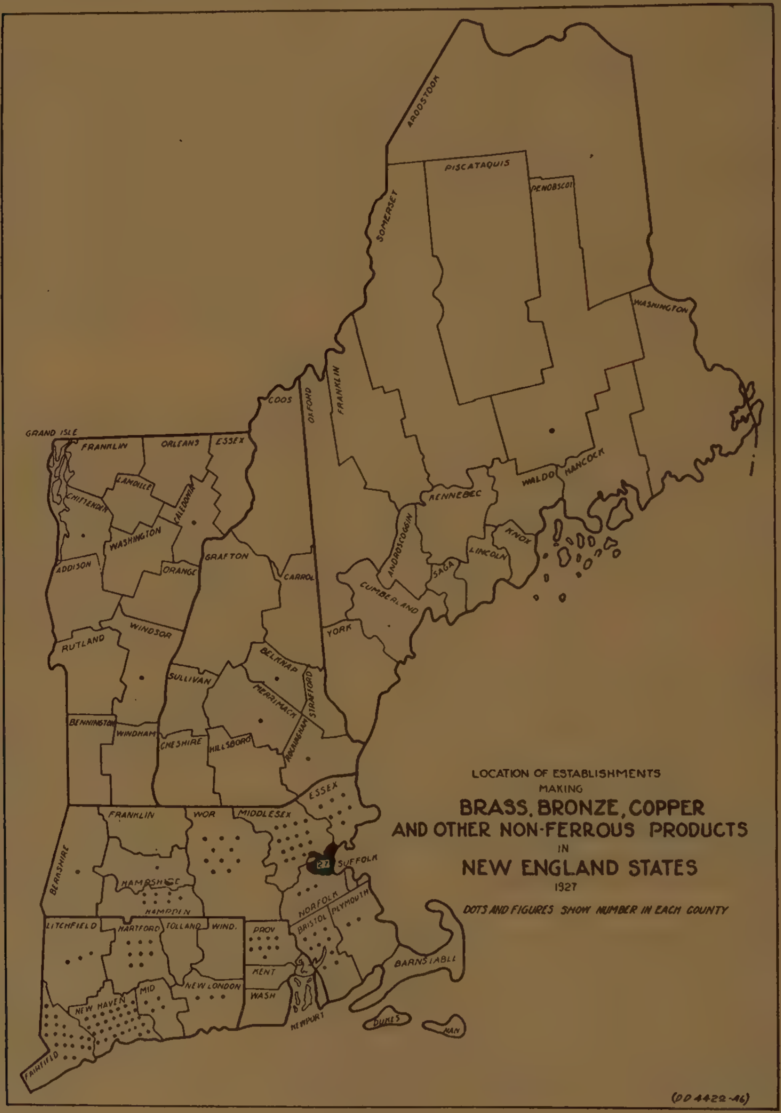
LOCATION OF ESTABLISHMENTS
MAKING
BRASS, BRONZE, COPPER
AND OTHER NON-FERROUS PRODUCTS
IN
NEW ENGLAND STATES
1927
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
27
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
HANCOCK
WALDO
KNOX
LINCOLN
SAGA
KENNEBEC
ANDROSCOGGIN
CUMBERLAND
YORK
FRANKLIN
OXFORD
COOS
GRAFTON
CARROLL
BELKNAP
STRAFFORD
MERRIMACK
ROCKINGHAM
SULLIVAN
CHESHIRE
HILLSBORO
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CALEDONIA
CHITTENDEN
WASHINGTON
ADDISON
ORANGE
WINDSOR
RUTLAND
BENNINGTON
WINDHAM
BERKSHIRE
FRANKLIN
WOR
MIDDLESEX
ESSEX
SUFFOLK
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
DUKES
NAN
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV
KENT
WASH
NEWPORT
MID
NEW HAVEN
NEW LONDON
FAIRFIELD
(DD 4422-46)

Figure 38

falling off in New England—1½ per cent—in comparison with a national increase of 27 per cent.

The growth of the industry in New England has resulted from an increase in the size of plants rather than from an increase in number. The average number of wage earners per plant in New England was 110 in 1914 and 141 in 1925. The averages outside New England were only 49 in 1914 and 45 in 1925.

In the matter of wages it is a significant fact that the average yearly wage per worker for this entire industry in New England was considerably lower than the average for the entire United States, the figures being $1,377 and $1,440, respectively. The average value of product turned out per wage earner in New England was $7,480, in comparison with $8,698 for the rest of the country.

The importance of the industry in each of the four States of New England for which separate statistics are available is shown in the following table.

MANUFACTURE OF BRASS, BRONZE, AND OTHER NONFERROUS ALLOYS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	67	20, 442	28, 538	97, 278	152, 390	55, 111
1925	64	20, 415	28, 339	102, 689	156, 142	53, 453
Massachusetts:						
1927	82	1, 912	2, 585	7, 584	12, 688	5, 105
1925	80	2, 182	2, 811	7, 581	13, 197	5, 616
Rhode Island:						
1927	11	115	147	318	663	345
1925	12	105	129	344	727	383
New Hampshire:						
1927	3	63	75	119	402	283
1925	6	100	117	293	502	209
Total:						
1927	163	22, 532	31, 345	105, 299	166, 143	60, 844
1925 [1]	162	22, 802	31, 397	110, 906	170, 568	59, 662
New England total, 1914 [2]	169	18, 608	11, 041	57, 903	76, 072	18, 170
United States total, 1925	1, 044	62, 942	90, 613	337, 641	519, 725	182, 084
New England as per cent of United States, 1925 [2]	15. 5	36. 2	34. 6	32. 8	32. 8	32. 8

[1] Not including 2 establishments in Vermont, 1 in Maine.

[2] Not including 2 establishments in Vermont.

The manufacture of brass, bronze, and copper products is a long-established industry in New England, and its products were among the earliest manufactures. Of 25 representative companies in this line, 7 have been in existence well over 50 years, and 2 of them more than a century. The average age for this whole group was 37 years.

CONDITIONS AS SHOWN BY REPORTING COMPANIES

Size of establishments.—Twenty-five manufacturers supplied information regarding their operations from 1921 to 1925. These represented plants ranging in size from small concerns with an annual volume of less than $20,000 to an enterprise with a business of $20,000,000. The annual output of these concerns in 1925, in proportion to their maximum capacity, was 79 per cent. There was a considerable variation among individual concerns. One-fifth of the companies reported branch plants, all of which are located in the same State as the parent company. Additions to plant capacity since 1921 were reported by one-fifth of the companies, with individual increases varying from 10 to 100 per cent. Reductions during this period were reported in two instances.

Raw materials.—The principal raw materials reported in these replies are copper, brass, bronze, and various other alloys, which are purchased in the majority of cases from New England dealers. A number of manufacturers reported, however, that their purchases are made chiefly in New York City.

Manufacturing practices.—This industry is subject to little seasonal variation, according to statements of three-fourths of the firms reporting. These stated that production is maintained at a fairly continuous rate throughout the year, affected only by general business conditions; consequently few plants have undertaken to develop secondary products or supplementary employment as a means for maintaining regular activity throughout the year.

The payment of workers on a basis of piecework or other incentive method was reported by only two-fifths of the 25 firms reporting, three-fifths of them stating that no factory workers were paid on such a basis. A number of the Connecticut plants, however, reported that various proportions of the men on their pay rolls are paid on a piecework basis.

Sales and marketing.—The majority of the companies reporting stated that their principal market is outside New England. Returns from 21 firms indicated that sales within New England represented 30 per cent of the aggregate volume of the group. Twelve companies stated that their principal market is in the Middle Atlantic States, 11 others reported markets in the East North Central States, 5 concerns reported important markets on the Pacific coast, and 2 others reported national distribution. Sales in foreign countries were reported by 10 of the reporting companies. The export sales of five of these which indicated the proportions of such trade amounted to a little over 4 per cent of their aggregate sales volume; exports ranged in individual instances from 2 to 20 per cent.

The trend of sales of these representative companies runs generally parallel to that of other industries up to 1924. The volume in 1922 showed an increase of 68 per cent and that of 1923 an increase of 42 per cent over the preceding year. There was a reduction of 11 per cent in 1924, but this was followed in 1925 by an 18 per cent increase, so that the latter year was higher than any of the preceding years in sales volume of these representative companies. The majority of the companies reported an increase in total volume of business in 1923, 1924, and 1925, while a little less than one-third of the reporting number indicated some falling off in volume. The reductions were attributed to increased competition and to changes in the market demand, while the companies with increased sales generally attributed such increase to lower cost of manufacture, to new selling methods, and to extension of sales territory.

The principal methods of distribution were indicated to be through wholesalers or direct to the manufacturing consumer. These two channels were about equally divided in the replies of individual companies. Most of the products are sold under a brand or trade-mark. The use of advertising was indicated by a little more than half of the companies, these depending mainly upon trade journals and direct mail.

JEWELRY, SILVER, AND PLATED WARE

JEWELRY

The jewelry industry in New England is highly localized in a relatively small area of southeastern Massachusetts and Rhode Island. These two States account for almost all the jewelry production of the region. The greater part of such manufacture is concentrated in Providence, in North Attleboro, and Attleboro, and adjacent towns. A small amount of jewelry is made in Connecticut. The product of Rhode Island, Massachusetts, and Connecticut represented 35 per cent of the national value of product in 1925 and about the same proportion of the national income from the manufacture of jewelry.

The principal products of New England manufacture are articles for personal adornment made from gold, silver, and platinum, as well as plain, engraved, or chased articles of bronze, brass, copper, or other metals, either with or without precious and semiprecious stones. The industry thus includes both the high-grade jewelry made from the precious metals and personal ornaments made from cheaper materials.

The making of jewelry provided a manufacturing income to Massachusetts and Rhode Island in 1927 exceeding $33,000,000, as shown by the value added by manufacture, exclusive of the cost of materials. The gross output in 1927 had a value exceeding $63,000,000, and the industry provided a market for materials used in manufacture of nearly $28,800,000. In the jewelry manufacture in these two States there were upward of 13,000 wage earners, who were paid more than $15,000,000 in wages.

Despite a considerable reduction in number of establishments—from 360 to 323—the jewelry output of Rhode Island and Massachusetts shows a substantial growth from 1925 to 1927. The gross value of product showed an increase of 7.7 per cent, and the addition to the income from jewelry manufacture increased by 12 per cent in the 2-year interval. There was an increase of nearly 1,000 in number of wage earners in these two States.

In 1904 New England produced nearly one-half (46.2 per cent) of the national total and in 1914, 44.5 per cent, thus almost maintaining its relative position in the national production. Although there was a considerable recession from 1914 to 1925 in its national position, the value of the New England product increased in this interval about 68 per cent, in comparison with a New England increase of 27 per cent in the 10 years preceding 1914. The importance of the industry in Rhode Island and Massachusetts is shown in the following table.

MANUFACTURE OF JEWELRY IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Rhode Island:						
1927	188	7, 826	8, 696	16, 587	35, 451	18, 864
1925	220	7, 039	7, 545	15, 442	31, 616	16, 173
Massachusetts:						
1927	135	5, 216	6, 574	12, 206	26, 781	14, 575
1925	140	5, 056	6, 378	12, 454	26, 156	13, 703
Total:						
1927	323	13, 042	15, 270	28, 793	62, 232	33, 439
1925 [1]	360	12, 095	13, 923	27, 896	57, 772	29, 876
1914	516	15, 484	8, 772	18, 022	36, 051	18, 029
1904 [2]	335	12, 147	6, 203	10, 428	24, 611	14, 183
United States total:						
1927	1, 367	24, 116	36, 766	76, 915	164, 865	87, 950
1925	1, 468	23, 837	35, 177	79, 886	166, 816	86, 931
Rhode Island and Massachusetts as per cent of United States: 1925	24. 5	50. 7	39. 6	34. 9	34. 6	34. 4

[1] Not including Maine, 1 establishment.
[2] Not including New Hampshire, 1 establishment.

CONDITIONS AS SHOWN BY JEWELRY MANUFACTURERS

Special information for this survey was provided by 113 jewelry companies who replied to inquiries regarding their manufacturing operations and their markets. The aggregate sales in 1925 of 97 of these companies which supplied figures were in excess of $26,000,000 and represented 45 per cent of the entire New England output, as reported in the census. Thus, these replies provide a very good cross-section of the whole industry.

Most of the companies included in this group are makers of miscellaneous products for the jewelry trade. Some of these make semimanufactured articles for sale to other manufacturers who make finished jewelry for the general trade. A few sell a portion of their output to other manufacturers and a portion as a finished product to the trade.

Raw materials.—There were 69 companies which indicated the purchase of gold, 38 of these reporting gold plate, and 12 others gold in some other semimanufactured form; the use of brass was indicated in 49 cases; silver, 48 firms; and sterling silver and nickel silver, 25 and 19 firms, respectively. Other materials were copper, nickel, white metal, gilder's metal, steel, platinum, zinc, lead, and antimony. Imitation stones were indicated by more companies than were the precious and semiprecious stones. Various other materials incidental to the finished products of this industry were mentioned in small quantities.

The source of these materials for companies making finished products for the general jewelry trade was given, in the majority of instances, as New England, 77 companies stating this source. Foreign sources, principally for stones and pearls, were next in frequency, 23 companies naming this source. Several of the concerns purchased materials in New York and in the other Middle Atlantic States, and a few stated they made purchases of materials in the East, North Central States. The majority of the companies whose product is sold to other manufacturers indicated New England as the source of their purchases.

Size and age of establishments.—Of the 113 reporting companies almost half had come into existence during the past 25 years and several within 10 years. There were 25 concerns which had been in operation 50 years or more and 35 between 25 and 50 years.

Branch plants were reported by 6 Massachusetts companies and by 4 Rhode Island companies, located mainly in near-by towns. One Massachusetts concern established a branch near by in 1916; another concern had a branch in Providence, established in 1920. A Rhode Island manufacturer of a special product reported branch plants in New York and Chicago, established in 1901 and 1906, respectively. A concern making college and high-school jewelry reports a branch in North Carolina, and another manufacturer established a branch in Quebec in 1914.

The size of individual establishments in this business is indicated by the following classification of the 97 companies giving individual sales figures. Their aggregate volume was in excess of $26,300,000, making the average of individual sales $271,000. There were 16 companies with individual sales in 1925 of less than $50,000; 22 companies between $50,000 and $100,000; 23 concerns between $100,000 and $250,000; 22 concerns between $250,000 and $500,000; and 14 concerns exceeding $500,000. There were three companies reporting individual sales exceeding $1,000,000.

More than half of the companies reported an average pay roll of less than 50 wage earners, and six-sevenths of all the companies reporting had a pay roll of fewer than 100. The classification of 101 companies, according to employment, was as follows: Thirty-four companies, fewer than 25 workers; 25 companies, between 25 and 50 workers; 26 companies, between 50 and 100 workers; 12 companies, between 100 and 250 workers; and 4 companies, more than 256 workers.

Wage incentives.—Incentive methods of wage payment were indicated by two-thirds of the companies, the proportions of total employees so paid ranging generally from 10 to 75 per cent, and in most cases being near the lower percentage. The aggregate number of employees paid by piecework or other incentive method was indicated to be about one-third of the total number employed by the reporting companies.

Operating ratio.—The ratio of output in 1925 to maximum productive capacity for 69 companies with aggregate sales of $19,500,000 was 66.3 per cent. Of 74 firms stating their percentages, 29 were running at from 75 per cent to full capacity; 36 were operating at 50 to 75 per cent; and 9 factories reported operations at less than one-half of their full capacity. A number of concerns had increased the capacity of their plants since 1921. Five companies reported a doubling and 1 a trebling of capacity; 11 others reported smaller increases, most of them less than 25 per cent. Reductions in capacity were reported in 5 instances; 1 other concern reported the closing of a branch factory. Of the concerns reporting increases in capacity 2 had sales exceeding $1,000,000 each, 5 others had sales exceeding $500,000, and the rest were less than $500,000. All the companies reporting reductions in capacity had individual sales of less than $500.000.

Sales trends.—The trend of sales was reported by 86 companies for the period 1921 to 1925 and by 96 companies for the shorter period, 1923 to 1925. The reports showed a general increase from 1921 through 1923, but after that a small decrease each year. Sales for the year 1925 showed an average increase of 20.7 per cent over those of 1921. There was a decrease of 7.5 per cent in 1924 compared with the preceding year, and in 1925 a decrease of 3.1 per cent, resulting in a net decrease of 10.3 per cent from 1923 to 1925. More of the smaller than of the larger companies experienced decreases in sales. Nearly three-fourths of the smaller companies with individual sales below $250,000 showed a reduction in volume from 1923 to 1925, while less than half of the large companies with sales exceeding $250,000 showed a decrease for the same period. A continuous increase in sales from 1921 to 1925 was reported by 10 companies and from 1923 through 1925 by 17 companies.

Sales within New England, as reported by 73 concerns with an aggregate volume of nearly $20,000,000, comprised approximately 30 per cent of the total. Of this number there were 60 manufacturers for the general jewelry trade whose New England sales amounted to 18.4 per cent of the aggregate total; and 13 companies whose product was sold to other manufacturers and who made approximately 50 per cent of their aggregate sales within New England. There were 20 manufacturers who reported upward of one-half of their sales as being made within New England, and 14 of this number sold 75 per cent or more in those States. There were 54 other companies reporting their New England sales as less than 25 per cent, and many of these were less than 10 per cent of their total volume.

Of 85 companies expressing themselves regarding the trend of their local sales, 30 stated that their sales within New England had increased in the last few years, 37 stated that they had fallen off, while 18 indicated no change in the situation. Reasons given for expansion of sales within New England were an increased line of products adapted to New England styles, expansion of 5-and-10-cent stores, increased sales effort, and more advertising. A few companies attributed increases to favorable general business conditions and one concern to "a new, younger, and more aggressive sales organization." Reasons given for decreases in New England sales were changes in demand resulting from style changes, outlays for automobiles and radios, competition in New England, greater attention to markets outside New England, and better wholesalers or jobbers outside New England. Several companies attributed a decline in their sales within this area to general business conditions or to a slump in the jewelry industry.

Location of markets.—Markets outside New England, ranked according to the number of times indicated, were located in the Middle Atlantic States, the East North Central, the South Atlantic, and East South Central States, the Central Western States, and the Pacific States. Concerns selling their product to other manufacturers confined their markets mainly to New England and the Middle Atlantic States, while a few reported sales in the Central States, the Pacific States, and to foreign countries. Competition was reported in the greatest number of instances from the Middle Atlantic States, although several indicated the East North Central States also. Little competition was indicated outside these areas.

Export sales were reported by 40 companies, and the average, as stated by 32 which gave sales figures, was 6.4 per cent of their aggregate business. The average exports, according to statements of nine companies selling to other manufacturers, were 4 per cent of their aggregate sales; while for companies selling to the general jewelry trade the average, as reported, was 7.6 per cent of total sales. Three individual companies reported exports of 25, 35, and 85 per cent, respectively; 5 concerns reported 10 to 15 per cent and 25 others less than 10 per cent, while 23 companies stated that they did no export business.

Distribution methods.—The prevailing method of distribution indicated in the replies was through wholesale dealers. Goods sold for further manufacture are usually sold direct to other manufacturers. Of concerns turning out finished jewelry for the general trade, 77 reported sales direct to wholesalers, and 23 others reported dealing directly with the retailer. A number of companies also deal through selling agents. A few reported sales through exclusive wholesale distributors and direct to the consumer. Two Rhode Island manufacturers of jewelers' findings reported sales offices in New York, and one of these has a sales office also in Chicago; while a Massachusetts company making general jewelry products has sales offices in New York and Chicago.

One large company making jewelry and novelties for colleges and fraternities, whose sales have had a substantial increase during the past few years and whose plant capacity has been considerably increased, have their own selling agents located at strategic points throughout the country. Orders are shipped from the factory direct to the customer. Most of the companies have salesmen who call upon the wholesale or retail trade in assigned territories. Where these sales areas are large the trips are necessarily infrequent, but the salesman with small territory covers the trade several times each year. Salesmen are reported to be paid for the most part, on a commission basis, but sometimes they receive a straight salary, which, in some cases, is supplemented with a commission or a bonus. Some companies depend entirely upon their catalogues for sales, but the general opinion is that a better view of marketing conditions and customer demand can be obtained through direct contacts made by salesmen. Some manufacturers state that they cater only to the existing demand, while others strive to create a demand for their product. The general statement is that customers now buy jewelry in smaller quantities and place their orders more often than in former years.

Trade-marks and advertising.—Less than one-half of the reporting companies stated that they used a brand, trade-mark, or other means of identifying their product. Thirty-seven companies stated that all their product is so marked, and 12 others trade-mark the greater portion. The use of trade-marks was indicated to about the same extent in the smaller concerns as in the large companies.

Most of the reporting companies use advertising in some form as an aid in marketing their products, but 15 companies stated specifically that they do no advertising, while 23 did not specify. Of the concerns which indicated use of advertising, the majority stated that they advertise on a national basis. The trade journal was mentioned in the majority of cases, 53 companies reporting this medium and 32 making use of direct mail advertising. Magazines and dealer helps were reported as supplementary mediums, while a number of companies depend mainly upon catalogues. The most frequent combinations reported were trade journals with other magazines and direct mail, or magazines and direct mail.

Labor and employment.—The trend of employment among these New England manufacturers follows very closely that for the industry as a whole in the United States. November is the month of maximum employment and July the minimum. A dull period is noticeable in the midsummer, followed by an active period in the late fall, in preparation for the holiday demand. The influence of holiday demand is difficult to overcome, and the main problem is to discover ways to stimulate sales during dull periods. The average employer finds it necessary to retain the major portion of his skilled labor during slack periods, often employing such workers in making up stock which is more or less standard. Efforts to develop supplementary products to keep employment and production more uniform throughout the year have been made, but with only partial success.

One manufacturer emphasizes the difficulty of getting trained men, stating that it is almost impossible to get the younger generation to learn the jewelry trade. He stated that on account of a shortage of suitable workmen his company was obliged to close its large factory, located in a Massachusetts city, and to purchase an interest in another concern in a near-by jewelry manufacturing town. On account of similar labor shortage there, however, he was contemplating locating in New York or New Jersey.

Changes and improvements.—Reports from these jewelry manufacturers state that many of them have been active in improving the conditions of manufacture through production control, cost accounting, and standardized products, but it is apparent that in many cases much remains to be done to improve conditions within the jewelry industry. The general policy of representative jewelry manufacturers in New England was the subject of a special inquiry in which each executive was asked to outline his company's policy and attitude regarding plant equipment and organization. The following statement by one of these executives embodies the views expressed in 26 replies:

> Our company believes that it is pursuing an open-minded, progressive policy in the matter of installation of new and modern equipment. The attitude of the jewelry industry in general is quite progressive regarding equipment, but I do not believe it is nearly so progressive in the installation of new administrative methods.

This executive reported that 27 firms which had been in business 10 years or more in the New England jewelry industry had either liquidated or failed during a recent 15-month period. He stated further:

> The discontinuance of a large number of these was caused by failure to readjust their production to changes in consumer demand and reluctance to scrap inefficient equipment for more efficient equipment. However, I believe many of the firms still operating are quite slow in adopting modern methods of cost accounting and factory management, although they show satisfactory activity in making changes in equipment or in their products.

Another executive states:

> There has been practically no new equipment invented for the jewelry industry in the last five years * * *. Our equipment is practically standard. Of course, we are desirous of maintaining up-to-date equipment, but the above limitations apply to the industry as a whole.

The important changes in the nature of demand which have vitally affected the market of jewelry products in the last few years are thus summarized by one manufacturer:

> There have been many material changes in consumer demand and in buying policies in the past five years. Staple articles have decreased steadily in sales. Many new items which deserved a better fate have found public favor only a short time. The consuming public seems to have become extremely changeable and fickle, constantly demanding new items, which they cast aside within a short time; as a result, manufacturing chronology has been completely revised. For a great many years the manufacturing sequence was the imitation of precious-metal and precious-stone jewelry, with some precious-metal and semi-precious-stone jewelry, followed by imitation of the second class of jewelry, with a third class of base metal and other inexpensive stone jewelry. For some time past the precious-metal and precious-stone jewelry have been imitated, first by the base metal and other inexpensive stone jewelry, thus eliminating the better grade of popular-priced jewelry and preventing the direct creation of original manufactures in base metal and inexpensive stone jewelry. In other words, the gap between the manufacture of high-priced jewelry and of the cheapest jewelry has decreased so greatly as to shut out largely what we call the popular-priced jewelry, and in some cases it has disappeared entirely.

Another manufacturer thus describes changes that have taken place:

> Consumer demand appears to be drifting away from the ornamental to the practical. Whereas in times past the word "jewelry" meant an item of adornment, it now means an item of utility; and the items selling most widely are those made to serve some specific utilitarian need.

Another manufacturer states:

> During the past five years competition in the jewelry business has been much greater than heretofore; the demand for this kind of merchandise has not been as great as it was just after the war. In novelties, however, the demand has been greater.

Many replies state that the change in demand from yellow gold to white or green gold has caused obsolete stocks. Others state that money which was formerly spent for jewelry is now going into automobiles, radios, and movies. Hand-to-mouth buying, to avoid the risk from overstocking, is noticeable in this industry. This is increasing in consequence of improved methods of distribution and transportation and of the reluctance of buyers to purchase in quantity. The resulting increased handling increases costs of distribution.

Regarding the growth of small-order buying by the trade, one of the executives previously quoted, writes as follows:

> Buying policies have changed from a "sample and stock" practice to a "sample practice" only, or to a "sample and minimum stock" policy, which is approximately the "sample only" practice. This is true to some extent even with the wholesaler, and to a great extent with the retailer. In a very great proportion of cases the retail jeweler to-day buys in quantities of one-twelfth of a dozen and reorders when that small stock has been sold. Except with the largest and most progressive retailers it is extremely difficult to persuade them to buy one-sixth of a dozen, so that they may have one article in stock during the interval between sale of the first piece and receipt of the replacement from the manufacturer.

SILVER AND PLATED WARE

This group of manufactures includes two closely allied types, which differ in some respects in their manufacturing and marketing activities. The making of plated ware—which includes table ware, toilet articles, and fancy articles plated with silver, gold, or other metals—is an industry of much larger volume in New England and in the United States than the manufacture of sterling-silver articles.

The New England output of these two kindred lines had an estimated value in 1925 not far from $50,000,000 and represented between 55 and 60 per cent of the total national production. The value of plated ware produced in Connecticut and Massachusetts comprised 55 per cent of the national total, while the silverware produced in these two States represented 35 per cent of the national value.

The aggregate value of silver and plated ware produced in Connecticut and Massachusetts in 1925 was $41,221,000, adding to their manufacturing income upward of $25,000,000. These industries gave employment to 8,621 wage earners, who were paid in wages $11,213,000, and provided a market for materials amounting to $16,173,000.

Slight increases since 1925 are shown in the available census figures for 1927, indicating that these industries have been doing better than holding their own in New England. The census figures appear in the following table.

MANUFACTURE OF PLATED WARE AND SILVERWARE IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
PLATED WARE						
Connecticut:						
1927	25	5, 536	7, 352	10, 549	26, 173	15, 624
1925	25	5, 563	7, 093	10, 117	26, 013	15, 896
Massachusetts:						
1927	14	1, 258	1, 548	1, 168	4, 401	3, 234
1925	13	1, 216	1, 504	1, 184	3, 900	2, 716
Total: [1]						
1927	39	6, 794	8, 900	11, 717	30, 574	18, 858
1925	38	6, 779	8, 597	11, 301	29, 913	18, 612
Connecticut and Massachusetts total:						
1914	32	5, 774	3, 278	5, 903	12, 532	6, 628
1904	27	3, 967	2, 161	3, 690	8, 309	4, 619
United States total, 1925	90	11, 290	15, 236	20, 071	54, 330	34, 259
Connecticut and Massachusetts as per cent of United States, 1925 [2]	42. 2	60. 0	56. 4	56. 3	55. 1	54. 4
SILVERWARE						
Massachusetts:						
1927	16	1, 247	1, 766	2, 607	7, 131	5, 524
1925	19	1, 253	1, 787	2, 882	7, 025	4, 143
Connecticut:						
1925	8	589	829	1, 990	4, 283	2, 293
Total, 1925 [2]	27	1, 842	2, 616	4, 872	11, 308	6, 436
Massachusetts and Connecticut, 1914 [3]	18	2, 854	1, 872	5, 626	8, 250	4, 544
Massachusetts and Rhode Island, 1904 [4]	31	3, 748	2, 528	4, 488	10, 037	5, 549
United States, total, 1925	93	5, 587	8, 607	13, 106	32, 532	19, 425
Massachusetts and Connecticut as per cent of United States, 1925 [1]	29	33. 0	30. 4	37. 2	34. 8	33. 1

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[1] Not including Maine, 1 establishment; New Hampshire, 1 establishment; Rhode Island, 1 establishment.

[2] Not including Rhode Island, 5 establishments; New Hampshire, 1 establishment.

[3] Not including Rhode Island, 10 establishments; New Hampshire, 2 establishments.

[4] Not including Connecticut, 2 establishments; New Hampshire, 1 establishment.

CONDITIONS AS REPORTED BY THE INDUSTRY

Number and size of establishments.—In all New England there were 41 establishments in 1925 making plated ware and 33 making silverware. The making of plated ware is confined principally to Connecticut and Massachusetts, there being 25 establishments in the former State and 14 in the latter, besides single plants reported in Rhode Island, Maine, and New Hampshire. Of the 33 New England concerns making silverware in 1925 there were 19 in Massachusetts, 8 in Connecticut, 5 in Rhode Island, and 1 in New Hampshire. No separate data are available for the latter two States.

In the making of silverware three New England States were in 1923 of approximately equal importance, Massachusetts contributing 35.5 per cent of the total New England production, while Rhode Island contributed 33 5, and Connecticut 31 per cent.

In Rhode Island the joint products of 6 establishments making silver and plated ware and 2 making cutlery had a value in 1925 exceeding $8,000,000, and in New Hampshire the product of 2 concerns making silver and plated ware and of 2 others making cutlery had a combined value exceeding $2,500,000. With the inclusion of four cutlery establishments, the total New England production of silver and plated ware in 1925 was $51,920,000.

In the national production of plated ware there are two outstanding regions—that of New England, concentrated in the middle and southern part of Connecticut, and the other in the central part of New York State. Production of New York State is about four-fifths that of Connecticut. In silverware, New York and New Jersey are the important producing States outside New England, the former with product of about $5,500,000 in 1925, and the latter somewhat less than $5,000,000. Massachusetts made a product exceeding $7,000,000 and Connecticut a product valued at $4,250,000.

Trends in the industry.—The trend of the plated-ware industry in Connecticut and Massachusetts shows an increase in number of establishments from 27 in 1904 to 32 in 1914, to 38 in 1925, and to 39 in 1927. There were corresponding increases in wage earners and in wages. The value of the product increased from 1914 to 1925 by 139 per cent. The production of these two States in 1914 represented 68 per cent of the national value, and in 1925, 55 per cent. The proportion of wages in these two States remained the same—65.6 per cent of the national total for the industry in both years—although the number of wage earners fell off from 66.2 per cent in 1914 to 60 per cent in 1925. This appears to indicate that this industry increased its total wage payment in New England more than in other sections of the country.

In silverware the value of the product in Connecticut and Massachusetts increased by 57 per cent from 1914 to 1925 and the manufacturing income in these States increased by 42 per cent. There was an increase in the number of establishments from 18 to 27 but a reduction in wage earners from 2,854 to 1,842. In 1914 these two States produced 41.2 per cent of the national value of silverware and in 1925 their portion was 34.8 per cent.

The sales trends of representative New England companies in these industries has been steadily upward since 1921. This is true to a fuller extent of makers of silverware than of plated ware; the former show a continuous and steady advance, while in plated ware there was a slight falling off in 1924, followed by a full recovery in the following year. Replies indicate fairly stable producing capacity. In these lines of industry employment runs fairly uniform throughout the year, with maximum activity in the fall months. In this respect the establishments making plated ware follow closely those making sterling-silver products.

Manufacturing practices.—Use of wage incentives was reported by about half the companies in each group, but the proportion of workers so employed was generally low. Only one silverware concern reported as high as 50 per cent of the workers on a piecework basis. The average is higher with makers of plated ware, where individual companies report as high as 70 or 80 per cent of their pay roll on a piecework basis. The fact that silver factories are manned almost entirely by skilled workers and that it is not practical to make many articles in large quantities makes the introduction of piecework on a large scale impractical. This is true particularly in the manufacture of silverware, where the outlay for silver is a larger item than is the case with plated ware. Piecework can also be employed more successfully in a flatware factory than in one where the hollow ware is made. In one large plant where 50 per cent of the workers are on piecework it was stated that in work where a high degree of perfection is obtained daywork produces better results than piecework and is as cheap in the end.

Distribution of products.—Distribution of the products of these New England industries is generally on a nation-wide basis. Sales to the New England market represent, in the case of silverware, an unweighted average of about 10 per cent among the companies reporting, and in the case of plated ware approximately 15 per cent. A few of the latter concerns report New England sales up to as high as 75 per cent of their total business, while others sell their entire output outside New England. Sales in New England have remained practically uniform for the last few years, the same number of companies reporting decreases as reported increases. Total sales volume increased for a substantial majority of these concerns.

The prevailing channel of distribution in silverware is direct to the retail dealers, only a few concerns reporting sales to wholesalers. In the distribution of plated ware, however, an equal number of concerns reported sales to retailers and to wholesale houses.

Trade-marks and advertising.—The use of trade-mark or of a company brand was reported by practically every silverware concern and by a majority of those making plated ware. National advertising, in which magazines, trade journals, and dealer helps were the principal mediums, was indicated by a majority of the silverware concerns, but by only about one-third of the manufacturers of plated ware.

OTHER METAL-USING INDUSTRIES

MOTOR EQUIPMENT

The making of motor vehicles, bodies, and parts, and of motor cycles and bicycles and parts is estimated to have added to the manufacturing income of New England in 1925 about $40,000,000, with a product whose total value exceeded $80,000,000. The approximate importance of the manufacture of these lines in 1925 is shown in the table on page 271, which contains such data as are available. These figures are exclusive of 4 establishments making automobiles, 2 concerns making motor-vehicle bodies and parts, and 1 manufacturer of bicycle equipment. With the addition of these establishments the table shows an estimated total of about 9,200 wage earners in this group, whose aggregate wages amounted to about $13,600,000. The products had an aggregate value of upward of $76,000,000, and contributed to the manufacturing income of New England, as a group, about $35,250,000.

The most important item in this group as a source of New England income is the manufacture of bodies and parts for motor vehicles. There were in New England 108 establishments in this line in 1925, with an output valued at upward of $36,000,000, representing 2.4 per cent of the value of the United States output. Massachusetts leads, with 66 establishments, whose product, valued at nearly $27,000,000, represented 74 per cent of the New England total and added upward of $12,000,000 to the manufacturing income.

The making of automobile bodies is concentrated largely in several towns in northeastern Massachusetts, where plants which formerly made carriages have turned to this line of manufacture. The making of parts for motor vehicles is of considerable importance in Connecticut, where 29 establishments had an output of nearly $8,000,000, and provided a manufacturing income for the State considerably exceeding $4,500,000. There were also eight concerns in Rhode Island, in addition to small plants in Maine, New Hampshire, and Vermont.

While the manufacture of automobiles and trucks in New England does not compare with that in the Middle West, yet there were 15 concerns engaged in this line in 1925, of which 9 were in Massachusetts, 4 in Connecticut, and 1 each in Maine and New Hampshire. The principal volume of manufacture is in Springfield, Mass., and Bridgeport, Conn. Data for Massachusetts show a product with a total value in 1925 of nearly $31,000,000, employing more than 1,500 wage earners and adding to the State's manufacturing income upward of $13,000,000. The product of Massachusetts comprised approximately 1 per cent of the total for the United States.

In the manufacture of motor cycles, bicycles, and parts there were 6 establishments reported for 1925 in Massachusetts, 3 in Connecticut, and 1 in New Hampshire. The nine concerns in Massachusetts and Connecticut made a product exceeding $9,000,000 in value and adding half this amount to their manufacturing income, with a total employment of 1,530 wage earners. More than 90 per cent of this activity was in Massachusetts. One of the leading motor-cycle manufacturers of the United States is located in Springfield. The product of the two States assumed substantial importance in the national total, representing 37.4 per cent of the value for the whole country.

RAILROAD EQUIPMENT AND REPAIR SHOPS

Repair shops operated in connection with steam and electric railroads are service industries that have to do with maintenance of the internal railway structure of New England. These repair shops are well distributed over the region and are of varying sizes. The total number reported for New England was 117 in 1925, of which 47 were in Massachusetts, 30 in Connecticut, 20 in Maine, 7 each in New Hampshire and Rhode Island, and 6 in Vermont.

It is estimated that together these repair shops added approximately $20,000,000 to the manufacturing revenue of the region, that they employed between 12,000 and 13,000 wage earners, paid approximately $18,000,000 in wages, and provided a market for materials and supplies amounting to $20,000,000. Data are available for only 96 of the establishments, with an aggregate employment in 1925 of 10,324 wage earners, who were paid in wages $15,209,000. These added $17,634,000 to the manufacturing income of New England, with gross products valued at $35,000,000. In Massachusetts there were 7,166 wage earners, who were paid $11,040,000 in wages. The data for the other States are incomplete.

In addition to repair shops, there were five New England establishments in 1925 engaged in the construction of steam or electric railway cars. Three of these were in Massachusetts, 1 in New Hampshire, and 1 in Maine. There is one establishment of considerable size located in Laconia, N. H. No statistics are available regarding the extent of construction activity by these establishments.

SHIP AND BOAT BUILDING

The building of ships and boats is an industry of considerable importance along the New England coast. In 1925 there were 96 concerns engaged in building steel and wooden ships and boats. Eighty-seven of these were classed as makers of wooden ships and boats and nine as engaged in the building of steel ships. This group contributed $12,745,000 to the manufacturing income of New England, provided employment for 6,059 wage earners, who were paid $9,577,000 in wages, provided a market for materials valued at $7,851,000, and turned out products valued at $20,595,000. In addition to this construction activity, repair work was of substantial importance, amounting to $8,956,000. The total addition to the New England income from construction and repair work is estimated to have been between $15,000,000 and $18,000,000.

Most of the plants engaged in these activities are relatively small concerns, the principal exception being the Fore River Shipyard at Quincy, Mass. There was formerly extensive shipbuilding also at Bath, Me., which is now discontinued. The census of 1925 reports four establishments in Maine engaged in the building of steel ships, employing 255 wage earners, with a product valued at $743,000.

In addition to the private concerns, the shipyards of the United States Government at Portsmouth, N. H., Charlestown, Mass., and New London, Conn., provided employment for a considerable number of workmen and afforded a considerable market for materials and equipment.

CLOCKS, WATCHES, CASES, AND PARTS

The manufacture of clocks, clock movements, and time-recording devices was represented in New England in 1925 by 14 establishments, 8 of which were in Connecticut and 6 in Massachusetts. They provided employment for about 3,400 wage earners, paying in wages

$3,998,000 and providing a market for materials amounting to $3,337,000. The products of these establishments added to the New England manufacturing income $7,506,000 and had a gross value of $10,843,000, which represented 37 per cent of the total for the entire United States. Connecticut represented 86 per cent of the production of the two States.

In the manufacture of watches and watch movements New England in 1925 had 5 of the 13 establishments engaged in this line in the whole United States; 3 of these were in Connecticut and 2 in Massachusetts. Waltham, Mass., and Waterbury, Conn., have long been important centers of watch manufacture. No separate data are available regarding the production or employment of this industry in New England.

NEEDLES, PINS, AND SIMILAR ARTICLES

Connecticut produced about 45 per cent of the national output of needles, pins, snap fasteners, and similar articles. Of the 48 establishments in the United States engaged in this line of manufacture in 1925, there were 26 in New England. Thirteen of these were in Connecticut, 8 in New Hampshire, 3 in Massachuetts, and 1 each in Rhode Island and Vermont. The data for the 21 establishments in Connecticut and New Hampshire show an employment of 3,065 wage earners, who were paid $3,095,000 in wages, adding to the manufacturing income of these two States $6,148,000. Their product had a value of $9,184,000, which was 50.5 per cent of the United States total.

FIREARMS

Connecticut and Massachusetts had 13 of the 20 establishments in the entire United States making firearms, and their product represented 75 per cent of the value of the national production. The industry in these two States contributed $9,046,000 to their manufacturing income, with a product valued at $11,274,000. There were employed 3,418 wage earners who were paid $4,282,000 in wages. In Connecticut there were eight establishments with 2,131 wage earners. The product of these establishments was valued at $7,218,000 and added $5,735,000 to the manufacturing income of the State. There were five establishments in Massachusetts, employing 1,287 wage earners and producing goods valued at $4,056,000, which contributed $3,331,000 to the manufacturing income of the State.

The manufacture of ammunition in New England is represented by 3 establishments in Connecticut and 2 in Massachusetts. Connecticut is the leading State in the Nation in this line, with a product valued at $21,018,000, representing 50.4 per cent of the value of the national product and 52.5 per cent of the national manufacturing income from this source. In this State there were 4,292 wage earners employed, who were paid $4,618,000 in wages. The industry added to the manufacturing income of the State $9,912,000 and provided a market for materials amounting to $11,015,000. No statistics are available for the 2 establishments in Massachusetts making ammunition nor for one company with 4 plants making explosives in that State.

MISCELLANEOUS METAL MANUFACTURES

In addition to the foregoing lines of metal manufactures which have been discussed individually, there are many others which are of substantial importance in their aggregate contribution to the New England manufacturing revenue. Some of these belong in the groups that have already been considered, and others do not admit of definite classification. Conditions in these lines do not differ greatly from those in the lines discussed in detail.

The importance of these items is shown for the individual States, as far as census figures are available, for 1925 and 1927 in the following table, which includes some of the items that have been discussed previously.

Miscellaneous Metal Manufactures in New England, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
TYPEWRITERS AND SUPPLIES						
Connecticut:						
1927	6	8,721	10,701	5,207	26,135	20,928
1925	6	7,038	8,793	4,433	19,603	15,170
United States total:						
1927	75	16,681	20,912	15,956	69,112	53,156
1925	70	14,969	18,804	15,157	63,080	47,923
STEAM FITTINGS AND STEAM AND HOT-WATER HEATING APPARATUS						
Massachusetts:						
1927	24	3,320	4,905	4,531	14,807	10,276
1925	26	3,991	5,475	5,237	16,426	11,189
Connecticut:						
1927	9	2,513	3,536	2,900	10,432	7,532
1925	8	2,542	3,736	3,216	10,969	7,752
Rhode Island:						
1927	4	145	183	571	1,439	868
1925	4	137	168	503	1,289	786
Total:						
1927	37	5,978	8,624	8,002	26,678	18,676
1925	38	6,670	9,379	8,956	28,684	19,728
United States total:						
1927	232	42,893	64,851	76,835	225,158	148,323
1925	225	43,260	63,979	77,357	228,930	151,573
WIRE DRAWN FROM PURCHASED BARS OR RODS						
Connecticut:[1]						
1927	5	894	1,395	3,600	7,290	3,690
Massachusetts:						
1927	15	3,805	6,242	11,292	22,882	11,590
1925	11	3,617	6,062	11,683	23,807	12,124
Total, 1927	20	4,699	7,637	14,892	30,172	15,580
United States total:						
1927	73	19,866	30,038	128,092	190,710	62,617
1925	68	18,544	26,928	127,251	184,463	57,212

[1] No data published for 1925.

MISCELLANEOUS METAL MANUFACTURES IN NEW ENGLAND, 1925 AND 1927—Contd.

CLOCKS, CLOCK MOVEMENTS, AND TIME-RECORDING DEVICES

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	9	4, 891	5, 751	4, 101	16, 167	12, 066
1925	8	3, 064	3, 575	2, 914	9, 333	6, 419
Massachusetts:						
1927	6	393	520	491	2, 179	1, 688
1925	6	349	413	423	1, 510	1, 087
Total:						
1927	15	5, 284	6, 271	4, 592	18, 346	13, 754
1925	14	3, 413	3, 988	3, 337	10, 843	7, 506
United States total:						
1927	52	9, 865	11, 751	10, 063	38, 196	28, 133
1925	45	7, 945	9, 238	8, 920	29, 379	20, 459

SHIP AND BOAT BUILDING

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	38	4, 185	6, 479	4, 403	14, 152	9, 749
1925	41	4, 167	6, 954	5, 558	14, 187	8, 629
Rhode Island:						
1927	9	600	860	1, 304	2, 493	1, 189
1925	8	611	831	642	2. 333	1, 692
Connecticut:						
1927	19	578	913	865	2, 455	1, 590
1925	19	675	1, 026	744	2, 107	1, 363
Maine:						
1927	21	343	423	525	1, 307	782
1925	28	606	766	907	1, 968	1, 061
Total: 1927	87	5, 706	8, 675	7, 097	20, 407	13, 310
United States total:						
1927	559	55, 014	87, 081	78, 626	211, 127	132, 501
1925	565	50, 224	74, 275	66, 299	177, 182	110, 883

MOTOR VEHICLES

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	6	1, 180	1, 670	5, 374	8, 345	2, 971
1925	9	1, 543	2, 558	17, 638	30, 819	13, 181
United States total:						
1927	264	187, 910	321, 664	1, 889, 426	2, 848, 443	959, 017
1925	297	197, 728	341, 210	2, 108, 192	3, 198, 123	1, 089, 931

BODIES AND PARTS FOR MOTOR VEHICLES

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	52	3, 993	5, 878	10, 073	18, 719	8, 646
1925	66	4, 676	7, 116	14, 616	26, 841	12, 225
Connecticut:						
1927	27	647	1, 018	1, 276	3, 072	1, 796
1925	29	1, 109	1, 480	3, 202	7, 827	4, 625
Rhode Island:						
1927	5	65	90	158	327	169
1925	8	344	456	899	1, 551	652
Total:						
1927	84	4, 705	6, 986	11, 507	22, 118	10, 611
1925	103	6, 129	9, 052	18, 717	36, 219	17, 502
United States total:						
1927	1, 213	181, 489	291, 291	641, 307	1, 151, 426	510, 120
1925	1, 358	228, 382	372, 721	862, 721	1, 523, 280	660, 559

Miscellaneous Metal Manufactures in New England, 1925 and 1927—Contd.

FIREARMS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	8	3,018	3,858	2,813	9,617	6,804
1925	8	2,131	2,668	1,483	7,218	5,735
Massachusetts:						
1927	4	1,389	1,765	874	4,792	3,918
1925	5	1,287	1,614	745	4,056	3,311
Total:						
1927	12	4,407	5,623	3,687	14,409	10,722
1925	13	3,418	4,282	2,228	11,274	9,046
United States total:						
1927	20	6,130	7,934	4,624	19,452	14,405
1925	20	4,470	5,584	3,174	15,179	12,005
STRUCTURAL AND ORNAMENTAL IRONWORK NOT MADE IN ROLLING MILLS						
Massachusetts:						
1927	71	1,394	2,274	5,101	11,239	6,138
1925	64	1,600	2,533	6,271	12,394	6,123
Connecticut:						
1927	19	389	649	1,440	3,111	1,671
1925	19	486	845	1,470	3,050	1,580
Rhode Island:						
1927	6	177	259	579	1,330	751
Total:						
1927	96	1,960	9,023	7,120	15,680	8,560
1925 [2]	83	2,086	3,378	7,741	15,444	7,703
United States total:						
1927	1,284	53,392	84,578	234,426	440,376	196,930
1925	1,136	48,341	77,411	237,653	420,998	183,345
STOVES AND WARM-AIR FURNACES						
Massachusetts:						
1927	20	2,033	2,968	2,752	9,849	7,097
1925	13	1,864	2,610	2,071	7,718	5,647
Maine:						
1927	4	183	239	214	632	418
1925	4	197	255	127	577	450
Total:						
1927	24	2,216	3,207	2,966	10,481	7,515
1925	17	2,061	2,864	2,198	8,295	6,097
United States total:						
1927	564	45,180	64,327	93,096	258,286	165,190
1925	323	29,376	41,493	47,249	140,805	93,556
STAMPED AND ENAMELED WARE						
Connecticut:						
1927	24	1,881	1,999	2,805	6,961	4,156
1925	25	1,967	2,254	3,104	7,444	4,340
Massachusetts:						
1927	22	944	1,375	1,759	4,690	2,931
1925	23	921	1,282	1,938	4,746	2,808
Rhode Island:						
1927	4	111	132	159	429	270
1925	---------	---------	---------	---------	---------	---------
Total:						
1927 [3]	50	2,936	3,506	4,723	12,080	7,357
1925	48	2,888	3,536	5,042	12,190	7,148
United States total:						
1927	365	28,594	35,155	65,581	141,793	76,212
1925	370	29,704	36,107	77,487	154,096	76,609

[2] Not including 6 establishments in Rhode Island.

[3] Not including Rhode Island.

Miscellaneous Metal Manufactures in New England, 1925 and 1927—Contd.

NEEDLES, PINS, HOOKS AND EYES, AND SNAP FASTENERS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	13	2, 353	2, 712	2, 358	8, 482	6, 124
1925	13	2, 371	2, 430	2, 917	8, 095	5, 178
New Hampshire:						
1927	5	378	402	89	642	553
1925	8	694	665	119	1, 089	970
Total:						
1927	18	2, 731	3, 114	2, 447	9, 124	6, 677
1925	21	3, 065	3, 095	3, 036	9, 184	6, 148
United States total:						
1927	45	5, 606	6, 098	5, 923	20, 325	14, 402
1925	48	5, 850	5, 856	5, 926	18, 174	12, 248

WIREWORK

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	29	1, 576	1, 922	3, 357	7, 198	3, 841
1925	26	1, 677	2, 016	3, 675	7, 567	3, 892
Connecticut:						
1927	21	951	1, 135	1, 745	4, 726	2, 981
1925	19	631	745	1, 416	3, 208	1, 792
Rhode Island:						
1927	5	84	67	131	286	155
1925	4	74	71	173	299	126
Total:						
1927	55	2, 611	3, 124	5, 233	12, 210	6, 977
1925	49	2, 382	2, 832	5, 264	11, 074	5, 810
United States total:						
1927	512	21, 697	26, 439	63, 093	128, 536	65, 443
1925	462	19, 268	23, 835	59, 604	115, 429	55, 825

PUMPS AND PUMPING EQUIPMENT

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	15	1, 893	2, 992	5, 849	12, 609	6, 760
1925	12	2, 052	3, 378	6, 548	13, 161	6, 613
United States total:						
1927	278	18, 671	27, 119	52, 755	130, 591	77, 826
1925	253	17, 935	25, 278	50, 328	120, 148	69, 820

FORGINGS, IRON AND STEEL, NOT MADE IN STEELWORKS OR ROLLING MILLS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	11	1, 157	1, 823	2, 129	6, 927	3, 798
1925	12	1, 654	2, 810	4, 673	11, 213	6, 540
Connecticut:						
1927	13	902	1, 378	1, 815	4, 432	2, 617
1925	14	1, 514	2, 311	3, 205	7, 441	4, 236
Total:						
1927	24	2, 059	3, 210	4, 944	11, 359	6, 415
1925	26	3, 168	5, 121	7, 878	18, 654	10, 776
United States total:						
1927	209	15, 399	23, 258	51, 635	103, 672	52, 037
1925	218	20, 290	31, 313	68, 081	134, 511	66, 430

MISCELLANEOUS METAL MANUFACTURES IN NEW ENGLAND, 1925 AND 1927—Contd.

SEWING MACHINES, CASES, AND ATTACHMENTS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	3	1, 552	2, 077	581	3, 959	3, 378
1925	3	1, 572	1, 973	562	3, 896	3, 334
Massachusetts:						
1927	8	767	884	869	3, 185	2, 317
1925	[illegible]	722	1, 017	826	2, 817	1, 991
Total:						
1927	11	2, 319	2, 961	1, 450	7, 144	5, 695
1925	11	2, 294	2, 990	1, 388	6, 713	5, 325
United States total:						
1927	41	11, 838	15, 879	16, 783	45, 222	28, 440
1925	41	12, 121	16, 100	18, 610	46, 299	27, 648

COPPER, TIN, AND SHEET-IRON WORK, INCLUDING GALVANIZED-IRON WORK

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	83	923	1, 636	2, 118	5, 985	3, 867
1925	94	1, 296	1, 984	2, 916	7, 445	4, 529
Rhode Island:						
1927	15	159	283	309	922	613
1925	19	183	310	392	1, 018	626
Connecticut:						
1927	17	177	318	624	1, 235	611
1925	28	210	328	562	1, 256	694
Maine:						
1927	8	68	97	157	368	211
1925	10	55	86	126	300	174
Vermont:						
1927	5	41	49	188	377	189
1925	4	31	36	109	258	149
Total:						
1927	128	1, 368	2, 383	3, 396	8, 887	5, 491
1925	155	1, 775	2, 744	4, 105	10, 277	6, 172
United States total:						
1927	1, 981	24, 527	38, 668	98, 386	191, 129	92, 743
1925	2, 107	24, 996	37, 825	84, 079	175, 043	90. 963

ENGINES AND WATER WHEELS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	13	1, 206	1, 739	2, 471	7, 218	4, 747
1925	13	978	1, 421	1, 323	4, 346	3, 023
Massachusetts:						
1927	5	207	292	284	903	619
1925	6	836	1, 261	989	3, 460	2, 471
Total:						
1927	18	1, 413	2, 031	2, 754	8, 121	5, 367
1925	19	1, 814	2, 682	2, 312	7, 806	5, 494
United States total:						
1927	215	54, 341	84, 791	165, 203	367, 879	202, 676
1925	220	51, 099	73, 585	145, 784	313, 588	167, 804

Miscellaneous Metal Manufactures in New England, 1925 and 1927—Contd.

BOLTS, NUTS, WASHERS, AND RIVETS, IRON AND STEEL, NOT MADE IN ROLLING MILLS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	7	1, 342	1, 744	1, 614	4, 523	2, 909
1925	9	1, 322	1, 807	1, 841	5, 073	3, 232
Rhode Island:						
1927	5	761	882	1, 279	2, 740	1, 461
1925	6	807	922	1, 163	2, 769	1, 606
Connecticut:						
1927	9	222	295	497	1, 248	751
1925	11	261	311	562	1, 379	817
Total:						
1927	21	2, 325	2, 921	3, 390	8, 511	5, 121
1925	26	2, 390	3, 040	3, 566	9, 221	5, 655
United States total:						
1927	115	13, 614	17, 324	38, 302	75, 876	37, 574
1925	127	13, 907	17, 942	38, 507	75, 926	37, 574

PLUMBERS' SUPPLIES (NOT INCLUDING SANITARY WARE, PIPE, OR MARBLE SLATE, AND PORCELAIN)

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	8	926	1, 201	1, 964	4, 454	2, 490
1925	9	1, 061	1, 395	2, 585	5, 070	2, 485
Massachusetts:						
1927	16	563	741	1, 964	4, 100	2, 136
1925	15	596	801	1, 847	3, 963	2, 116
Total:						
1927	24	1, 489	1, 942	3, 928	8, 654	4, 626
1925	24	1, 657	2, 196	4, 432	9, 033	4, 601
United States total:						
1927	231	29, 245	40, 212	55, 633	148, 879	93, 246
1925	239	33, 280	46, 954	63, 610	167, 878	104, 268

MOTOR CYCLES, BICYCLES, AND PARTS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	6	1, 363	1, 661	3, 580	7, 598	4, 018
1925	6	1, 421	1, 843	4, 125	8, 329	4, 204
Connecticut:						
1925	3	109	150	410	754	344
United States total:						
1927	29	3, 897	5, 442	10, 174	21, 454	11, 280
1925	36	4, 193	5, 662	12, 177	24, 258	12, 081

CHILDREN'S CARRIAGES AND SLEDS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	11	1, 450	1, 651	2, 843	6, 126	3, 283
1925	9	1, 221	1, 410	2, 391	5, 314	2, 994
United States total:						
1927	89	7, 030	7, 814	13, 895	28, 668	14, 773
1925	86	6, 926	7, 923	13, 553	30, 174	16, 620

Miscellaneous Metal Manufactures in New England, 1925 and 1927—Contd.

SCREW-MACHINE PRODUCTS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	14	852	1,069	1,986	4,111	2,125
1925	17	856	1,092	2,097	4,273	2,176
Massachusetts:						
1927	24	448	625	743	1,888	1,145
1925	30	526	679	849	2,127	1,278
Total:						
1927	38	1,300	1,694	2,729	5,999	3,270
1925	47	1,382	1,771	2,946	6,400	3,454
United States total:						
1927	205	9,967	13,778	20,895	48,138	27,243
1925	193	8,987	12,669	18,788	43,779	24,991

STEEL SPRINGS (RAILWAY, VEHICLES, HEAVY MACHINE, ETC.), NOT MADE IN ROLLING MILLS

Connecticut:						
1927	5	1,024	1,400	1,912	4,664	2,752
1925	4	1,049	1,408	2,144	4,953	2,809
Massachusetts:						
1927	4	28	44	67	184	117
1925	4	32	51	49	178	129
Total:						
1927	9	1,052	1,444	1,979	4,848	2,869
1925	8	1,081	1,459	2,193	5,131	2,938
United States total:						
1927	94	5,753	8,913	24,599	43,821	19,222
1925	98	5,897	8,989	23,609	44,469	20,860

WOOD SCREWS

Connecticut:						
1927	5	1,636	1,548	1,561	4,196	2,635
1925	5	2,194	2,050	2,344	6,225	3,881
United States total:						
1927	13	3,723	4,277	5,015	11,882	6,867
1925	12	5,084	5,525	6,288	15,836	9,548

NAILS, SPIKES, ETC., NOT MADE IN ROLLING MILLS

Massachusetts:						
1927	22	849	1,094	1,970	4,444	2,475
1925	22	932	1,055	2,228	5,039	2,811
United States total:						
1927	56	2,100	2,670	5,156	11,753	6,597
1925	58	2,227	2,610	5,646	12,319	6,673

SAWS

Massachusetts:						
1927	11	598	804	1,179	3,144	1,966
1925	10	691	925	1,192	3,391	2,199
United States total:						
1927	77	4,182	5,754	7,674	22,628	14,954
1925	71	4,710	5,873	8,224	26,781	18,557

MISCELLANEOUS METAL MANUFACTURES IN NEW ENGLAND, 1925 AND 1927—Contd.

TIN CANS AND OTHER TINWARE

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	8	581	734	1,641	3,212	1,571
1925	7	597	692	1,645	3,148	1,503
United States total:						
1927	236	29,721	167,028	169,421	253,479	84,057
1925	221	29,901	34,392	175,779	260,360	84,581

ELECTROPLATING

Massachusetts:						
1927	38	272	380	160	894	734
1925	38	324	428	183	1,000	817
Rhode Island:						
1927	8	65	81	49	223	174
1925	12	93	96	65	283	218
Connecticut:						
1927	8	53	75	53	183	130
1925	11	55	81	52	218	166
Total:						
1927	54	390	536	263	1,300	1,038
1925	61	472	605	300	1,501	1,201
United States total:						
1927	419	3,556	5,629	3,335	13,930	10,595
1925	449	3,337	5,254	2,541	12,441	9,900

ALUMINUM

Connecticut:						
1927	6	192	301	1,026	1,621	595
Massachusetts:						
1927	9	139	180	714	1,111	397
1925	7	165	224	683	1,186	503
Total, 1927	15	331	480	1,740	2,732	992
United States total:						
1927	139	14,798	20,892	79,838	123,557	43,719
1925	127	14,353	19,753	84,985	127,831	42,846

GOLD, SILVER, AND PLATINUM REDUCING AND REFINING, NOT FROM THE ORE

Rhode Island:						
1927	13	47	73	2,213	2,555	342
Massachusetts:						
1927	4	15	22	1,733	1,863	130
1925	17	152	150	391	643	252
Total, 1927	17	62	95	3,946	4,418	472
United States total:						
1927	57	801	1,435	58,887	62,647	3,770
1925	65	1,258	2,166	88,867	95,243	6,376

SCALES AND BALANCES

Massachusetts:						
1927	4	67	114	136	491	355
1925	4	73	109	104	485	381
United States total:						
1927	60	3,906	5,461	7,454	24,655	17,202
1925	71	4,292	5,783	7,349	27,237	19,888

MISCELLANEOUS METAL MANUFACTURES IN NEW ENGLAND, 1925 AND 1927—Contd.

WATCH AND CLOCK MATERIALS AND PARTS, EXCEPT WATCHCASES

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	6	134	158	68	367	299
1925	5	173	188	101	411	310
United States total:						
1927	17	415	407	315	1,309	994
1925	25	501	480	376	1,363	987

GOLD AND SILVER, LEAF AND FOIL

Massachusetts:						
1927	18	142	145	258	540	286
1925	17	152	150	391	643	252
United States total:						
1927	77	1,146	1,120	1,721	3,571	1,850
1925	84	1,148	1,113	1,839	3,746	1,907

AGRICULTURAL IMPLEMENTS

Maine:						
1927	4	107	124	150	427	277
1925	4	109	165	137	366	229
Vermont:						
1925	5	83	93	110	230	120
Total:						
1925	9	192	258	247	596	349
United States total:						
1927	277	33,346	46,415	85,666	202,732	117,066
1925	303	28,695	37,388	1,110	2,925	1,815

SMELTING AND REFINING, METALS OTHER THAN GOLD, SILVER, OR PLATINUM, NOT FROM THE ORE

Massachusetts:						
1927	6	63	86	1,731	1,984	253
1925	5	36	82	1,465	1,558	93
United States total:						
1927	102	2,776	4,280	68,894	80,771	11,876
1925	102	2,944	4,680	69,263	82,138	12,875

IRON AND STEEL, PROCESSED

Massachusetts:						
1927	5	33	49	82	193	111
1925	4	28	40	104	203	99
United States total:						
1927	33	231	392	510	1,443	934
1925	26	306	557	643	2,114	1,471

TEXTILES

Textile manufacturing has long been regarded as the mainstay of New England's industrial prosperity. The output of this line has for many years far exceeded in value that of any other type of manufacture. The greatest number of workers have depended upon the textile industries for their livelihood, and the wages paid annually have exceeded those of any other major group.

PLACE IN NEW ENGLAND INDUSTRIAL LIFE

Wages paid by the textile industries in 1925 were approximately one-third of the New England total in all classes of manufacture, and the number of wage earners employed was considerably more than one-third. The gross value of textile products was in about the same proportion as the wages paid. The outlay for materials consumed in textile manufacture, however, was considerably more than one-third of the total outlay in all the industries of the region. Consequently the net revenue brought by the textile industries to the people of New England was considerably less than one-third of the aggregate income from all manufacturing.

The income from the New England textile industries, as shown by the value added by manufacture, amounted to something over $798,000,000 in 1925, although the gross value of the products exceeded $2,000,000,000. These figures, however, include only what may be termed the primary textile industries—those which are engaged in spinning, weaving, and processing various fabrics from the raw fibers and yarns. This group of primary industries includes manufactures of cotton, wool, and silk, also knit goods, cordage, and twine. The dyeing and finishing of textile materials is included as a distinct part of the textile industry.

In addition to the primary manufactures there is also a group of secondary textile industries which includes the making up of the primary products into wearing apparel and industrial goods. These secondary industries of New England are considered in a separate section of this report.

The textile industries of New England are located chiefly in the southern States of that section (Massachusetts, Rhode Island, and Connecticut), but they are of substantial importance also in Maine and New Hampshire. The textile industries of Vermont are only a small portion of the New England total; nevertheless, they contribute a considerable part—upward of one-eighth—of the total manufacturing income of that State.

The textile industries of New England have been undergoing pronounced changes, particularly since the World War. Although these changes have been most striking in the last few years, they have been in process to a lesser degree for a long time. As far back as 1904 the New England textile industries had difficult problems to face. These became acute by 1910, and increased in seriousness up to the outbreak of the World War. The industry in New England then faced readjustments, but in the intensity of war-time activity textile mills of the whole country forgot their previous troubles and entered upon a period of capacity production—indeed they greatly increased their capacity. Consequently, no effective readjustments in the textile industries took place until a number of years after the restoration of normal peace-time conditions. Not until after 1923 did this industry face its real crisis. Conditions that had been developing for more than a generation have since then pressed for a solution.

To understand the present conditions of the New England textile industry it is thus necessary to consider developments that have their beginning much farther back than the World War. It should be borne in mind first of all that the textile industries of New England have been facing a situation that is not unique to their section of the country. These industries in other parts of our own country, and in foreign countries as well, have had to face similar conditions.

A marked expansion in producing capacity took place everywhere from the special demands for textile products created by the World War. Old plants that had been shut down in previous years were reopened, and numerous new plants were built to supply the markets of Europe in addition to the regular markets of the United States. Great expansion took place in the American export trade—an expansion which continued for some years after the war. The excess producing capacity which had been developed thus created a problem that would have required later solution even if the usual conditions had continued in the textile industries.

A number of unexpected and unknown factors, however, came into play. First of these was a drastic reduction in consumption of textile materials. This reduction, resulting mainly from changes in modes of dress, was not confined to the United States, but was worldwide. There were radical changes in the types of textiles which the market demanded. Staple lines gave way, in large measure, to fancy specialties and novelties, in which style was the primary consideration rather than quality. Radical changes took place also in the marketing of textiles—from piece goods to ready-to-wear garments.

These changes had a serious effect on the methods of manufacture. Changes from staples to style goods made it impossible to manufacture for stock; hence, New England textile mills which were organized for quantity production found it difficult to maintain regularity of operation and output.

The periodic ordering of large quantities for a whole season which had been the prevailing practice has given way in recent years to smaller orders for current requirements, repeated at frequent intervals, whereas orders were formerly placed twice a year for four to six months ahead.

Difficulties in adjusting production plans to these new conditions account, in large measure, for the depression of the New England textile industries. All lines were affected by these difficulties, but in varying degrees. The cotton industry suffered most of all, because of the intense regional competition resulting from expansion in other sections of the country. The wool industry has suffered particularly from curtailed consumption of wool fabrics.

The textile industries faced a more serious situation than other lines of New England manufacture, largely because they had undergone a smaller degree of organization. On account of the number of highly specialized processes involved in textile manufacture it has been difficult to integrate the different steps in production and marketing, or to exercise systematic control over relations between manufacture and selling. Organization had been mainly on the production end, with minor attention to marketing.

COTTON MANUFACTURES

IMPORTANCE IN NEW ENGLAND

Cotton manufacturing, the most important single textile industry of New England, provided 9.3 per cent of the region's entire income from all manufactures in 1925 and 52.5 per cent of the income from all primary textile manufacturing. The total output had a value in that year of nearly $656,000,000, and brought an income of about $273,000,000 to the region, as indicated by the value added by manufacture, exclusive of the cost of materials. Of this income more than $186,500,000 was paid in salaries and wages to 182,000 persons engaged in the industry. A pay roll exceeding $169,500,000 was distributed to 175,850 wage earners.

The New England cotton industries paid nearly $383,000,000 for raw materials, fuel, power, supplies, and other operating equipment.

The value of the products of cotton manufacturing in New England was 36 per cent of the value of such products in the whole country, but this region contributed almost 40 per cent of the total national value added by cotton manufacture. In the number of wage earners New England had 37.5 per cent of the total for the whole country, but the New England workers were paid 45 per cent of all wages in cotton manufacturing.

LOCALIZATION

Although the cotton industries of New England are important in each State except Vermont, they are of outstanding importance in Massachusetts and Rhode Island. These two States had, in 1925, about 90 per cent of the total number of establishments and 75 per cent of all the persons engaged in cotton manufacture, and contributed nearly 75 per cent of the value of the total New England output.

Massachusetts had approximately 101,700 persons engaged in this line, while in Rhode Island there were about 35,500 persons so engaged. Connecticut and New Hampshire ranked about equally in the number of persons engaged in cotton manufacture, with over 15,500 persons in each State. The value of the product in Connecticut was considerably greater, however, with $65,740,000, compared with $58,909,000 for New Hampshire. In Maine there were over 12,000 persons engaged in cotton manufacturing, and the total production had a value in excess of $41,000,000. Cotton manufacturing in Vermont is of slight importance in the New England total, with only 904 persons thus engaged in 1925 and a product valued at somewhat less than $3,200,000.

In the total value of cotton manufactures in New England the percentages contributed by the individual States were approximately

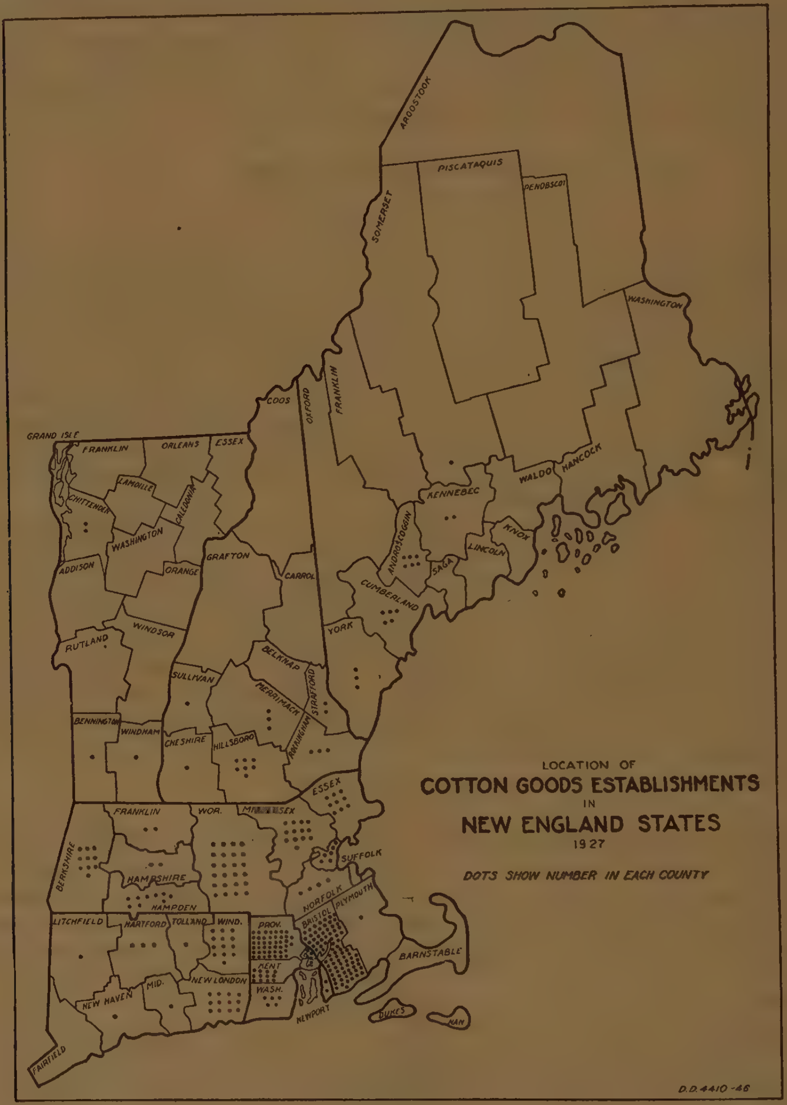
LOCATION OF
COTTON GOODS ESTABLISHMENTS
IN
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
KNOX
LINCOLN
ANDROSCOGGIN
SAGA
CUMBERLAND
YORK
CARROL
GRAFTON
BELKNAP
STRAFFORD
MERRIMACK
ROCKINGHAM
SULLIVAN
CHESHIRE
HILLSBORO
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
WINDSOR
RUTLAND
BENNINGTON
WINDHAM
ESSEX
FRANKLIN
WOR.
MI[illegible]SEX
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
NEWPORT
NEW LONDON
MID.
NEW HAVEN
FAIRFIELD
DUKES
NAN
D.D.4410-46

Figure 39

as follows: Massachusetts, 54; Rhode Island, 19; Connecticut, 10; New Hampshire, 9; Maine, 6; and Vermont, less than 1 per cent.

The following table shows the importance of cotton manufacturing in the individual States and the share of the New England cotton industry in the national total in 1925 and 1927.

IMPORTANCE OF INDIVIDUAL STATES OF NEW ENGLAND IN ALL COTTON MANUFACTURES, 1925 AND 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars: Wages and salaries	Thousands of dollars: Wages	Thousands of dollars: Cost of materials
Massachusetts:						
1927	221		93, 599		90, 773	152, 439
1925 [1]	230	101, 691	98, 939	102, 762	94, 394	207, 925
Rhode Island:						
1927	126		31, 240		32, 665	55, 335
1925	150	35, 828	34, 420	38, 765	34, 686	72, 487
Connecticut:						
1927	59		15, 831		16, 639	32, 666
1925 [2]	58	15, 587	14, 773	17, 301	15, 190	39, 585
New Hampshire:						
1927	22		14, 974		15, 383	27, 188
1925	23	15, 534	14, 987	15, 436	13, 865	36, 608
Maine:						
1927	17		10, 195		9, 781	17, 351
1925	16	12, 059	11, 851	11, 284	10, 518	24, 307
Vermont:						
1927	4		1, 008		1, 055	1, 361
1925	4	904	880	954	881	1, 957
Total:						
1927	449		166, 847		166, 296	286, 340
1925	481	181, 603	175, 850	186, 502	169, 534	382, 869
United States total:						
1927	1, 610	504, 688	489, 037	448, 711	403, 828	915, 206
1925	1, 638	483. 724	468, 352	[3] 420, 224	377, 050	1, 132, 330
New England as per cent of United States, 1925	29. 4	37. 5	37. 5	44. 4	44. 96	33. 8

State and year	Value of products: Thousands of dollars	Value of products: Per cent of all manufactures in each State	Value of products: Per cent of all cotton manufactures in New England	Value added by manufacture: Thousands of dollars	Value added by manufacture: Per cent of all manufactures in each State	Value added by manufacture: Per cent of all cotton manufactures in New England
Massachusetts:						
1927	297, 005	9. 0	52. 4	144, 566	8. 8	51. 5
1925	358, 239	10. 4	54. 6	150, 314	9. 2	55. 1
Rhode Island:						
1927	109, 578	18. 5	19. 3	54, 243	19. 4	19. 3
1925	128, 527	20. 7	19. 6	56, 040	20. 3	20. 5
Connecticut:						
1927	64, 113	5. 0	11. 3	31, 447	4. 6	11. 2
1925	65, 741	5. 2	10. 0	26, 156	3. 9	9. 6
New Hampshire:						
1927	58, 709	17. 9	10. 3	31, 522	21. 7	11. 6
1925	58, 909	18. 0	9. 0	22, 301	16. 5	7. 2
Maine:						
1927	34, 414	9. 2	6. 1	17, 064	10. 5	6. 1
1925	41, 188	11. 1	6. 3	16, 882	10. 2	6. 2
Vermont:						
1927	3, 146	2. 3	. 6	1, 785	2. 8	. 7
1925	3, 195	2. 3	. 5	1, 238	2. 0	. 5
Total:						
1927	566, 965			280, 625		
1925	655, 799		100. 0	272, 930		100. 0
United States, total:						
1927	1, 659, 519			744, 313		
1925	1, 819, 886			687, 556		
New England as per cent of United States, 1925	36. 0			39. 7		

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[1] Excludes data for 6 establishments to avoid disclosing individual operations.
[2] Excludes data for 1 establishment to avoid disclosing its operations.
[3] Not including 1,463 salaried officers and employees of central admistrative offices, with salaries of $3,893,756.

The importance of cotton in relation to other industries varies in the individual States to a marked degree. In this respect Rhode Island stands at the head, with one-fifth of all its manufacturing revenue derived from this source; New Hampshire comes next with one-sixth; in Maine it is about one-tenth. In Massachusetts, the largest maker of cotton goods in New England, this industry contributed less than one-tenth of the State's total revenue from manufacturing. In Connecticut cotton manufacturing is of decidedly minor importance, contributing less than 4 per cent of the State's total revenue from manufacturing; in Vermont, it is less than 2 per cent.

Although some cotton manufacture is scattered about many parts of New England, the greater portion of the industry is localized in a few highly specialized areas. In the total of 67 counties 97 per cent of all spindles in place on July 1, 1927, were in 19 counties. Two adjacent counties—one in southern Massachusetts and the other in Rhode Island—then contained more than one-half the total number of cotton spindles in all New England. Bristol County, Mass., with the cities of Fall River, New Bedford, Taunton, and a number of other towns engaged largely in cotton manufacturing, had more than 7,000,000 spindles, comprising over two-thirds of the total number in Massachusetts and more than two-fifths of the New England total. In this one county there were more spindles in place than in any other single State of the Union.

Providence County, in Rhode Island, with the important cotton cities of Pawtucket, Central Falls, Woonsocket, and other mill towns of the Blackstone Valley, had more than 1,600,000 spindles and ranked second in importance not only in New England but in the United States. Two other adjacent Rhode Island counties, Kent and Bristol, added more than 700,000 spindles to this great cotton-manufacturing area. This general region extends westward into Connecticut, whose two easternmost counties, Windham and New London, contained more than 1,100,000 spindles. In these six adjacent counties of southern New England there were 10,633,480 spindles, comprising over 63 per cent of the New England total.

The next highly concentrated area of the cotton-manufacturing industry is in northeastern Massachusetts and southeastern New Hampshire along the Merrimack River, containing the important textile cities of Lowell, Lawrence, Manchester, Nashua, and several adjacent mill towns. The three counties in which these mills are located—Middlesex and Essex in Massachusetts and Hillsborough in New Hampshire—had a total of 2,144,188 cotton spindles, comprising 13 per cent of the New England total.

The nine counties in the two major regions just described account for over 75 per cent of the total number of cotton spindles in New England. In addition to these highly concentrated areas there are in central and western Massachusetts three other counties—Worcester, Hampden, and Berkshire—each of which had more than 500,000 cotton spindles; and a fourth, Hampshire County, had over 100,000 spindles. In southeastern Maine, also, four neighboring counties—Kennebec, Androscoggin, Cumberland, and York—had a total exceeding 1,100,000 spindles. In New Hampshire two other counties, Strafford and Merrimack, had a total of 437,700 spindles.

Of the 19 counties of New England containing more than 100,000 spindles each, 7 are in Massachusetts, 4 in Maine, 3 in New Hampshire, 3 in Rhode Island, and 2 in Connecticut. New England had the distinction of containing within its borders in 1925 all but four of the counties of the United States with more than 500,000 cotton spindles.

Principal Counties and Centers of Cotton Manufacture

County and State	Approximate number of establishments, 1925	Number of spindles in place, July 31, 1927	Principal centers
Bristol, Mass.	93	7, 157, 574	Fall River. New Bedford, Taunton.
Providence, R. I.	51	1, 643, 774	Pawtucket, Woonsocket, Central Falls, Providence.
Hillsborough, N. H.	6	889, 444	Manchester, Nashua.
Middlesex, Mass.	15	679, 444	Lowell, Waltham.
Hampden, Mass.	10	663, 088	Chicopee, Holyoke, Springfield.
Windham, Conn.	17	649, 304	Willimantic and several towns in Quinebaug Valley.
Worcester, Mass.	31	623, 668	Fitchburg, Worcester, Clinton.
Essex, Mass.	11	575, 300	Lawrence, Salem.
Berkshire, Mass.	11	552, 700	Adams, North Adams.
Kent, R. I.	14	482, 312	West Warwick, Warwick.
New London, Conn.	13	477, 352	Norwich, New London, and several towns in Thames River Valley.
Androscoggin, Me.	6	423, 644	Lewiston.
York, Me.	2	398, 584	Biddeford.
Strafford, N. H.	3	325, 000	Dover.
Bristol, R. I.	5	223, 164	Several towns.
Hampshire, Mass.	2	184, 800	Holyoke.
Kennebec, Me.	2	157, 768	Waterville, Augusta.
Cumberland, Me.	3	138, 320	Several towns.
Merrimack, N. H.	3	112, 700	Do.
Total for 19 counties	298	16, 357, 940	
Other 48 counties	51	513, 418	
All New England (67 counties)	349	16, 871, 358	

The distribution of cotton manufacturing in New England, outside the 19 leading counties designated above, may be seen from the following enumeration of mills by counties and States, as of 1925:

Massachusetts.—Suffolk, 9; Franklin, 4; Norfolk, 3; Plymouth, 2; total, 18.

Rhode Island.—Washington, 7; Newport, 1; total, 8.

Connecticut.—Hartford, 4; Middlesex, 4; Fairfield, 3; Litchfield, 1; New Haven, 1; Tolland, 1; total, 14.

Maine.—Sagadahoc, 1; Somerset, 1; total, 2.

New Hampshire.—Rockingham, 3; Cheshire, 1; Sullivan, 1; total, 5.

Vermont.—Chittenden, 2; Bennington, 1; Windham, 1; total, 4.

NATURE OF PROCESSES

Cotton manufacture in New England includes a group of distinct activities and processes that are closely related but result in a variety of products.

Starting with opening the bales of raw cotton, the fibers must go through a number of preliminary processes that terminate in spinning. The product of this first stage is cotton yarn and its by-product is cotton waste. The yarn produced in the first stage may be put through processes of dyeing and finishing before being woven into cloth, or it may be woven directly to make gray goods. In some instances the cotton fiber is dyed before spinning, but this is not a prevailing practice. This yarn is the basic material for weaving different kinds of cotton cloth and for making small wares, as well as for making sewing thread and lace. Cotton yarn is used also with wool, silk, or rayon in making various woven mixtures and also to supply the cotton content of knitted goods.

Most of the woven cotton cloth must go through further processes of bleaching, dyeing, printing, or other forms of finishing before it is ready for the market. The processing depends upon the kind of goods and varies widely with the type of fabric that is being manufactured. The making of woven goods also involves great technical variation in weaving, in equipment, and in the types of yarns that are used. It is thus a highly specialized industry, requiring much skill and experience.

Expansion in cotton manufacturing has fostered a high degree of specialization and the integration of distinct manufacturing processes. Some cotton mills confine their activity to spinning yarns for sale or for use by other establishments. Some are engaged wholly in weaving cloth or in making small wares from purchased yarns made in other establishments. The greater portion of the industry in New England, however, is carried on in large establishments which have departments both for spinning the yarn and for weaving the yarn into cloth.

Most cotton mills spin yarn and weave it into "gray goods," which is the general name for unfinished woven cotton cloth as it comes from the loom. The gray goods pass through various processes of bleaching, mercerizing, dyeing, printing, or other finishing, after leaving the looms.

Most of these finishing processes are done in establishments not connected with the mills, fitted with specialized machinery and equipment, according to the nature of the finishing required. While many of the larger concerns have complete establishments for carrying through the manufacturing processes, from the spinning of the yarn to the finishing of the cloth for the market, these latter activities are usually carried on by separate concerns which specialize in the distinct equipment and processes necessary for this work. Such processing of cloth is done largely under contract, by the pound or yard. Since the dyeing and finishing of textiles is a distinct branch of textile manufacture, it is discussed separately from cotton manufacturing. (See p. 319.)

The outstanding textiles produced for sale by New England cotton mills are woven goods. These comprise about 70 per cent of the value of all their cotton manufactures, with a product valued in 1925 at close to $460,000,000. Yarns for sale had a value exceeding $68,000,000 and comprised slightly over 10 per cent of the value of all cotton manufactures. Cotton small wares, valued at nearly $45,000,000, comprised 6.8 per cent of the total, and cotton thread, with a value of nearly $44,000,000, made up 6.7 per cent of the total. Woven goods, yarns for sale, cotton small wares, and cotton thread thus comprised upward of 93 per cent of the value of all New England cotton manufactures in 1925. In addition to these major items, other products making up the remainder of 6.4 per cent consist of the cotton waste made by New England mills, with a value exceeding

$19,000,000; cotton lace, estimated at more than $6,000,000; and other unclassified cotton products worth $16,800,000. These figures for cotton manufactures do not include knit goods or the cotton contained in woolen or silk mixtures, except in so far as they are covered by the cotton yarn manufactured in New England for sale to these and other industries.

PRODUCTS OF NEW ENGLAND COTTON MANUFACTURES IN 1925

Product	Value	Per cent of New England total	Product	Value	Per cent of New England total
Woven goods	$459, 897, 000	69. 8	Cotton lace	[1]$6, 267, 000	1. 0
Yarns for sale	68, 178, 000	10. 3	All other cotton products	16, 801, 000	2. 5
Cotton small wares	44, 901, 000	6. 8			
Thread	43, 912, 000	6. 7	Total	659, 093, 000	100. 0
Cotton waste	19, 137, 000	2. 9			

[1] Estimated for New England.

DEVELOPMENT IN NEW ENGLAND

THE INDUSTRY PRIOR TO 1880

The present condition of cotton manufacturing in New England, as well as its prospects for the future, is the result of a long period of development, which must be understood in order to comprehend its problems. The growth of this industry has not only been of paramount significance in the whole industrial development of New England, but it has influenced greatly the character of factory development throughout the United States.

Cotton manufacture in the United States dates from 1790, when the first successful cotton factory in America was established at Pawtucket, R. I., by an Englishman, Samuel Slater, with the aid of a financier in near-by Providence, whose name is perpetuated in Brown University of that city. This first single venture, with its 72 spindles, expanded in 135 years to a national industry which in 1925 numbered over 1,600 establishments and more than 34,000,000 active cotton spindles. Within 30 miles of the first undertaking in Rhode Island, 53 mills, equipped with 448,000 spindles, had been established by 1812, and there were more than a score of other mills in Massachusetts. During and following the War of 1812 the shutting off of British goods provided a great stimulus to American cotton manufacture.

The first mills were confined to spinning cotton yarn for weaving in the household. The early industry was hampered by lack of power looms. In 1820 two-thirds of the textiles used in the United States was still made in the homes. The first complete cotton factory in America for spinning and weaving was established in 1813 at a waterfall on the Charles River at Waltham, Mass. This was the first factory in the world in which all processes for converting cotton into cloth by means of power machinery were carried on within one building.

With the rapid growth of this plant at Waltham, its water power became insufficient. This led to the extension of cotton manufacture to the Merrimack River, where a site that became the city of Lowell was cleared from the forest, and the water power of the river at that point was harnessed by means of a system of canals. The immediate success of the first mill established there in 1823 led to the rapid development of cotton manufacture, whereby Lowell became a city in 1836, and by 1860 was the largest city in Massachusetts outside of Boston. Soon after the founding of Lowell expansion of the cotton industry led to the establishment of mills at other waterfall points along the Merrimack River, where Lawrence, Manchester, and Nashua soon became important cotton-mill towns. Manchester had five cotton mills by 1845. In Maine mills were established at water-power sites on the Saco River, at Saco and Biddeford, and at Lewiston, on the Androscoggin, at about the same time as those along the Merrimack. In western Massachusetts development of water power on the Connecticut River, by a dam at Hadley Falls, in the same period, brought about the development of Holyoke, which was planned as a cotton-manufacturing town, although it has become more widely known as a paper-manufacturing center.

These developments north and west of Boston were promoted and directed mainly by Boston capitalists and were financed by joint-stock associations. They were large enterprises in which great amounts of capital were required. Their success was based upon large-scale operation and the making of standardized products, in which individual mills concentrated their efforts largely upon the manufacture of a single type of fabric.

The development of cotton manufacture in the southern portion of New England differed fundamentally from that north of Boston in that the mills were owned and operated mainly by individual proprietors and were not financed by outside capital. Hence the mills were smaller and more numerous; they were also generally established in or close to existing towns and cities. By 1840 the Blackstone River had 94 cotton factories along its banks between Worcester and Providence. In these mills of southern New England attention was given to making a variety of products of high quality rather than to large-scale production of standardized fabrics.

After the founding of Lowell, which was made possible by external capital employed in the utilization of water power on a large scale, no new element entered into New England cotton manufacture until about 1850. Up to that time water power was so cheap and plentiful that steam power generated from purchased coal could not compete with it. The smaller streams, however, had been developed to their utmost capacity and the mills were handicapped by fluctuations in their power supply, arising from flood as well as drought. The introduction of steam power was therefore a great advantage to cotton manufacture, not only because it increased the regularity of mill operation but also because it could be expanded to meet the demands of the growing market. As early as 1845 the water power at Lowell was supplemented by the use of steam. In 1870 water furnished power for 68 per cent of the equipment of New England cotton mills. By 1905, however, the situation had changed, so that steam then furnished power for 68 per cent of the mill equipment, and water less than one-fourth of the total.

The employment of steam power stimulated the development of mills at points on the coast, where coal could be transported cheaply by water and unloaded at docks near by. Thus a new set of rivals to the older mills that had been established at water-power sites in the interior came into being along the New England coast—at Newburyport, Salem, and Portsmouth, north of Boston, also at Newport, Bristol, and Warren, on Narragansett Bay in Rhode Island. In addition to their advantageous location in respect to coal, they had another asset in the humidity of their climate, which is a distinct aid in manipulating cotton fibers. In these coast centers the development of cotton manufacture was promoted by local capital. With the combination of these favorable factors the cotton centers along the coast advanced far beyond the inland cotton mills that had been established earlier.

In Fall River, which held the leadership in cotton manufacture for a number of years, more than 100 cotton mills became established, although until 1865 this center was of little consequence. Its prosperity was founded upon the use of tidewater coal, which placed no limit upon the expansion of power which might be used to turn cotton-mill machinery.

New Bedford, also on the coast only 20 miles distant from Fall River, turned to cotton manufacturing when the decline of the whaling industry led the men of fortune in that city to invest their funds in this industry in its place. Both Fall River and New Bedford were developed by local capital. Close rivalry for first position as a manufacturing center has existed between these two places since 1910. In Fall River the emphasis was placed upon mass production of medium and low grade fabrics, in which the competition from the newly developed manufactures of the South has become especially keen. New Bedford mills, on the other hand, specialized in the finer class of yarns and woven goods, and therefore they have not felt this competition so acutely.

A map showing the present location of New England cotton mills would strikingly reveal two facts—(1) that most of the large mills are at water-power sites on fresh-water streams of considerable size, and (2) that those not having water-power facilities are close to tidewater. The older mill development was dependent on power from New England waterfalls. The natural expansion of these older mills has been most pronounced in places where this power was most abundant and regular.

New England dominated the market for cotton manufactures until 1880. At that date over 80 per cent of all the cotton spindles of the United States were located in New England mills. There were then only slightly more than 500,000 spindles in the cotton-growing States of the South, and of more than 10,000,000 spindles in all the Northern States, 8,632,000 were in New England. New England mills in 1880 consumed 1,129,500 bales of cotton, while the cotton-producing States consumed only 188,750 bales. The supremacy of New England in this field of manufacturing at that time was unquestioned.

CHANGES SINCE 1880

The 45 years from 1880 to 1925 embrace three distinct periods of change in the status of cotton manufactures in the United States.

The first of these, covering roughly a quarter of a century, extended from 1880 to about 1904; the second period includes the decade from 1904 to the beginning of the World War in 1914; the third, extending over 11 years from 1914 to 1925, includes the World War and the subsequent years of adjustment.

The first of these periods, ending in 1904, witnessed a marked expansion of cotton manufacturing in the South, especially in North Carolina, South Carolina, and Georgia. The number of cotton-manufacturing plants outside New England increased in this period from 317 to 798, while the number in New England fell off from 439 to 356. The increase in number of active spindles in New England during this first period was 5,571,000, bringing the total number of spindles in this section up to 14,203,000 in 1905—an expansion of 65 per cent after 1880. There was a greater increase in the number of spindles outside New England, however, amounting to 7,463,000, which brought the total spindles in other States in 1905 up to 9,485,000—an increase of 369 per cent as compared with 1880.

The increase in yardage of cotton cloth woven in New England during the period from 1880 to 1905, however, exceeded slightly the increase in yardage outside this region; and the increase in value of the New England output was likewise slightly in excess of the total increase in all the other States. In annual income derived from cotton manufactures, as shown by value added by manufacture, the increase in New England exceeded $100,000,000, while in the rest of the United States the increase in value added was less than $64,000,000.

By 1900 there were more cotton mills in the South than in New England, but up to that time New England mills continued to consume more than one-half of the raw cotton used in the entire country. By 1905 the cotton-growing States had surpassed New England in the quantity of cotton consumed. While the consumption of domestic cotton in New England grew from 1,500,000 bales in 1890 to 1,753,000 bales in 1905, in the same interval the cotton-growing States increased their consumption from 539,000 bales to 2,140,000 bales.

This period, which ended shortly after the beginning of the twentieth century, thus marks the entry of the South into cotton manufacture as a formidable competitor of the New England mills. The growth of southern mills, which were invading a field previously dominated by the North, occasioned much alarm to the northern cotton manufacturers. During this time of rapid Southern expansion the same spirit of industrial development possessed the South as had possessed New England a generation or two earlier. The advantages which favored this expansion of the South were an abundance of cheap labor, cheap water power, and the nearness of supplies of raw cotton. This new expansion went through an early testing stage similar to that of the early cotton manufactures in New England. Inexperience of the promoters and the lack of skilled operatives in this period limited the southern manufactures mainly to the coarser fabrics.

NEW ENGLAND CONSUMPTION OF RAW COTTON AND PRODUCTION OF COTTON CLOTH, CENSUS YEARS 1880 TO 1927, AS COMPARED WITH REST OF THE UNITED STATES

Year	Cotton consumed (thousands of bales)			Cloth produced (thousands of square yards)		
	New England	United States, outside New England	New England as per cent of United States	New England	United States, outside New England	New England as per cent of United States
1927	1,676	5,731	22.6	2,662,765	6,317,650	30.0
1926	1,610	5,074	24.1	(1)	(1)	(1)
1925	1,708	4,725	26.6	2,607,368	5,134,200	33.7
1924	1,434	4,088	26.0	(1)	(1)	(1)
1923	1,946	4,575	29.8	3,143,581	5,120,639	38.0
1922	1,823	4,087	30.8	(1)	(1)	(1)
1921	1,614	3,279	33.0	2,809,820	3,894,016	41.9
1920	2,397	4,023	37.3	(1)	(1)	(1)
1919	2,165	3,601	37.5	2,824,924	3,492,474	44.7
1918	2,403	4,164	36.6	(1)	(1)	(1)
1917	2,414	4,374	35.6	(1)	(1)	(1)
1916	2,389	4,009	37.3	(1)	(1)	(1)
1915	2,149	3,448	38.4	(1)	(1)	(1)
1914	2,219	3,358	39.8	[2] 3,218,756	3,594,784	47.2
1913	2,178	3,305	39.7	(1)	(1)	(1)
1912	2,076	3,053	40.5	(1)	(1)	(1)
1911	1,882	2,616	41.8	(1)	(1)	(1)
1910	1,995	2,626	43.2	(1)	(1)	(1)
1909	2,144	3,096	40.9	[2] 3,194,421	3,073,140	51.0
1908	1,895	2,644	41.7	(1)	(1)	(1)
1907	2,073	2,912	41.6	(1)	(1)	(1)
1906	2,060	2,849	42.0	(1)	(1)	(1)
1905	[3] 1,753	2,526	41.0	(1)	(1)	(1)
1904	----------	----------	----------	[2] 2,606,664	2,503,645	51.0
1900	1,909	1,964	49.3	(1)	(1)	(1)
1890	1,502	1,016	59.6	(1)	(1)	(1)
1880	[4] 1,129	[3] 441	71.9	1,813,479	459,799	79.8

[1] Not a census year. [2] Not including Vermont. [3] Not including foreign cotton. [4] Cotton mills only.

NEW ENGLAND COMPARED WITH REST OF UNITED STATES IN COTTON SPINDLES IN PLACE, SPINDLE ACTIVITY, AND ACTIVE SPINDLE HOURS, 1880–1927

Year	Cotton spindles in place [1] (thousands)			Active spindles (thousands)			Active spindle hours (millions)		
	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States
1927	16,871	19,824	46.0	14,995	19,414	43.6	32,914	71,436	31.5
1926	17,946	19,640	47.7	15,526	19,225	44.7	31,718	65,311	32.7
1925	18,333	19,596	48.3	15,975	18,783	45.6	32,655	61,945	34.5
1924	18,576	19,228	49.1	17,066	18,783	47.6	27,184	53,091	33.9
1923	18,930	18,479	50.6	18,054	18,206	49.8	39,009	60,499	39.2
1922	18,856	18,089	51.0	17,939	17,769	50.2	37,034	55,667	39.9
1921	18,734	17,884	51.2	18,388	17,660	51.0	(2)	(2)	(2)
1920	18,543	17,292	51.7	18,287	17,194	51.5	(2)	(2)	(2)
1919	18,393	17,050	51.9	18,066	16,865	51.7	(2)	(2)	(2)
1918	18,267	16,674	52.3	17,985	16,558	52.1	(2)	(2)	(2)
1917	18,001	16,220	52.6	17,761	16,128	52.4	(2)	(2)	(2)
1916	17,788	15,545	53.4	17,474	15,332	53.3	(2)	(2)	(2)
1915	17,526	15,315	53.4	17,101	14,864	53.5	(2)	(2)	(2)
1914	17,683	15,061	54.0	17,408	14,699	54.2	(2)	(2)	(2)
1913	17,620	14,529	54.8	17,311	14,208	54.9	(2)	(2)	(2)
1912	17,571	14,012	55.6	17,140	13,439	56.1	(2)	(2)	(2)
1911	17,045	13,759	55.3	16,511	13,012	56.0	(2)	(2)	(2)
1910	15,981	12,948	55.2	15,735	12,532	55.7	(2)	(2)	(2)
1909	15,766	12,808	55.2	15,592	12,426	55.6	(2)	(2)	(2)
1908	15,481	12,484	55.4	15,329	12,176	55.7	(2)	(2)	(2)
1907	15,164	11,776	56.3	14,913	11,463	56.5	(2)	(2)	(2)
1906	14,408	11,404	55.8	14,408	10,843	57.1	(2)	(2)	(2)
1905	13,816	9,856	58.4	14,203	9,485	60.0	(2)	(2)	(2)
1900	13,171	6,293	67.7	13,171	6,301	67.6	(2)	(2)	(2)
1890	10,934	3,450	76.0	10,934	3,450	76.0	(2)	(2)	(2)
1880	8,632	2,021	81.0	[3] 8,632	2,021	81.0	(2)	(2)	(2)

[1] The statistics prior to 1915 relate to year ending August 31, and those since 1915 to year ending July 31.

[2] No records available prior to 1922.

[3] Cotton mills only.

CHANGES FROM 1904 TO 1914

Changes in cotton manufacture up to the beginning of the World War were in the direction of continued expansion outside New England, although the industry made a gradual increase in this older section. In this period leadership in the coarser and cheaper grades of cloth was definitely surrendered to the South. Although many New England mills continued to make the coarser staples, fuller attention was given to the higher grades of cotton manufacture, and increasing numbers of mills were turning to the finer goods. In this respect New England was following the example set by the British cotton industry, which had made up for the earlier losses of its markets for coarser goods by specializing in the finer qualities of yarns and cloth.

A factor of increasing importance to the cotton industry in this period was the use of electric power in place of steam. The place of steam had not been challenged until after 1900, but electrification of cotton mills swept forward rapidly after 1910, so that by 1923 more primary horsepower was furnished to the cotton mills of the country by electric motors than by steam engines.

CHANGES SINCE 1914

The period of the World War and the years immediately following it witnessed conditions which upset the normal developments in this industry and deferred the adjustments that otherwise would have come sooner. In common with the rest of the country in all manufacturing lines, the cotton mills of New England were stimulated by the possibilities for high war-time profits. During the war the mills were run at maximum capacity. The number of cotton mills in New England increased from 380 in 1914 to 459 in 1919, and to 510 in 1923. The number of active spindles was increased from 17,408,000 in 1914 to 18,066,000 in 1919, and to a maximum of 18,388,000 in 1921.

The year 1919 found New England textile mills running at capacity to fill orders placed at high war-time prices. This was followed in 1920 and 1921 by a sharp drop in prices and a curtailment of production, which affected all industries in the period of postwar deflation. A brief interval of recovery in 1922 and 1923 again brought prosperity of short duration and led to a further expansion of New England cotton manufactures, making 1923 the year of maximum output, exceeding any of the war years except 1919.

During the period from the beginning of the war there had been little change in the conditions of production within the industry except a great rise in wage rates and a wide expansion in the use of electric power. Not until after 1923 did any general adjustment become apparent in the whole cotton-manufacturing industry. New forces which had been developing in the past two decades then bore upon this industry with intensity. There was a pronounced falling off in cotton manufacturing in 1924, but conditions were somewhat better in 1925. The New England cotton manufacturing industry, in the period from 1923 to 1925, showed a decline in its output for the first time (aside from the postwar deflation) since its start more than a century before.

COTTON CONSUMPTION AND SPINDLE ACTIVITY

As a purchaser of raw cotton New England attained its peak in the war years—1916, 1917, and 1918—reaching the maximum of 2,415,000 bales in 1917. There was a marked falling off in 1919, with recovery in 1920, when the amount was 2,397,000 bales. The sharp slump in 1921 reduced the New England consumption to 1,614,000 bales. This was followed by an increase in 1923 to more than 2,000,000 bales, and a sharp falling off again in 1924, when it was the lowest of any recorded year since 1900. Since then the consumption has shown some increase, and in 1927 it was 1,675,000 bales.

Figures on the consumption of raw cotton are at best a crude indicator of manufacturing activity; they are only approximate for any one year, and they do not allow for carry-overs from year to year or for partially manufactured cotton in mill stocks. Neither do they indicate at all the degree of fabrication employed in changing the raw material into the manufactured product for sale. This varies greatly with the type of fabric made, much more cotton being required to make a yard or a given unit of value of coarse, heavy fabrics than of fine, light goods, such as are produced largely by New England mills.

The number of spindles in place is commonly used as an indicator of producing capacity of cotton mills. The total number in New England showed a continuous increase year by year up to 1923, when the maximum of 18,930,000 spindles was reached. The number of spindles in place declined to 16,872,000 in 1927, and to 15,463,000 spindles in 1928. These figures, however, do not show the degree of utilization of spinning equipment, since they make no allowance for inactive plants or for idle spindles in active plants.

A better indicator of activity is afforded by the number of active spindles. The maximum in New England was reached in 1921, when the actives spindles numbered 18,388,000. Since 1923 the number of active spindles has shown a decline year by year, with a total number of 14,995,000 in 1927 and of 13,815,000 in 1928.

But figures of active spindles make no allowance for equipment active only a portion of the time, or for its employment in overtime production. A more accurate measure of mill activity is afforded by the number of active spindle hours, which is based on the time the spindles are in operation. Figures on this basis are available for each year and each month since July, 1921. The high point in spindle activity in New England was reached in the calendar year 1923. From this maximum it fell off nearly 30 per cent in 1924. The next year, however, the number of spindle hours increased to within 16 per cent of the 1923 volume. In 1926 there was a reduction of 3 per cent from the preceding year, but the total activity in 1927 was slightly greater than in 1925 and higher than in any other year since 1923.

CHANGES IN TOTAL ACTIVITY

In value of products the high point of New England cotton manufactures was reached in 1919, the year of war-time price inflation, when the value of products of New England cotton manufacture exceeded a billion dollars. From this peak there was a tremendous falling off in the deflation period of 1920 and 1921. A substantial recovery was made in 1922 and 1923. This was followed by a considerable falling off again in 1924, and in 1925 the total value was about $120,000,000 below that for 1923.

Comparison of changes in the value of total output for the 10-year census period from 1904 to 1914 with the 11-year period from 1914 to 1925 shows the increase in the earlier period to have been 47.2 per cent, while for the later period it amounted to 94.4 per cent. The value added by manufacture showed an increase of 48.6 per cent from 1904 to 1914, and an increase of 102.8 per cent from 1914 to 1925. These figures make no allowance for differences in dollar values.

The number of New England establishments engaged in cotton manufacturing was at its peak in 1923, with 510 plants reported by the census for that year. In 1914 there were 380 establishments, which was an increase of 24 plants over the number operating in 1904; this increase all took place before 1910. During the war period, from 1914 to 1919, there was an increase of 79 establishments. From 1919 to 1921 the number fell off by 10. In the next two years there was an increase of 61. From 1923 to 1925 the number was reduced by 29 establishments. From 1914 to 1925 there was a net increase of 101 establishments.

TOTAL COTTON-MANUFACTURING ACTIVITY OF NEW ENGLAND AS COMPARED WITH REST OF UNITED STATES, 1880–1925

Year	Establishments		Persons engaged				Salaries and wages (thousands of dollars)	
			Total		Wage earners			
	New England	United States outside England	New England	United States outside England	New England	United States outside England	New England	United States outside England
1925	481	1, 157	181, 603	302, 121	175, 850	292, 502	186, 501	233, 723
1923	510	1, 132	215, 447	296, 213	208, 685	286, 512	231, 645	143, 550
1921	449	1, 078	198, 682	241, 763	192, 438	233, 379	195, 206	185, 300
1919	459	1, 037	218, 059	244, 814	211, 118	235, 734	208, 727	201, 761
1914	380	948	199, 003	204, 908	195, 003	198, 401	95, 575	74, 248
1909	380	944	192, 348	195, 423	188, 984	189, 896	83, 562	63, 709
1904	356	798	162, 647	160, 640	159, 473	156, 401	62, 896	43, 548
1900	364	691	167, 005	140, 758	164, 944	137, 917	60, 064	33, 975
1890	402	503	148, 718	72, 867	147, 359	71, 517	49, 909	19, 581
1880	439	317	----------	----------	127, 185	45, 359	----------	----------

Year	Total value of product (thousands of dollars)			Value added by manufacture (thousands of dollars)		
	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States
1925	655, 799	1, 164, 087	36. 0	272, 931	414, 625	39. 7
1923	775, 209	1, 234, 932	38. 6	358, 795	450, 728	44. 3
1921	594, 134	736, 129	44. 7	286, 838	311, 840	47. 9
1919	1, 034, 755	1, 160, 811	47. 1	425, 088	455, 576	48. 3
1914	337, 324	363, 977	48. 1	134, 624	123, 154	52. 2
1909	316, 543	311, 849	50. 4	143, 509	113, 874	55. 8
1904	229, 101	221, 367	50. 9	90, 568	73, 645	55. 2
1900	191, 691	147, 509	56. 5	88, 543	64, 106	60. 6
1890	181, 112	86, 869	67. 6	80, 011	33, 058	70. 8
1880	143, 363	48, 727	74. 6	69, 073	20, 811	76. 8

Source: U. S. Census of Manufactures.

CHANGES IN COTTON MANUFACTURE WITHIN AND OUTSIDE NEW ENGLAND 1904–1914 AND 1914–1925

Item	Actual units each year			Percentage increase	
	1904	1914	1925	1904 to 1914	1914 to 1925
Number of establishments:					
New England	356	380	481	6. 7	26. 6
United States outside New England	798	948	1, 157	18. 8	22. 0
Active spindles (number):					
New England	14, 203, 000	17, 408, 000	15, 975, 000	22. 6	[2] 8. 2
United States outside New England	9, 485, 000	14, 699. 000	19, 057, 000	55. 0	29. 6
Consumption of cotton (pounds):					
New England	846, 024, 000	1, 041, 083, 642	[1] 850, 390, 000	23. 1	[2] 18. 4
United States outside New England	1, 030, 413, 000	1, 482, 417, 000	[1] 1, 224, 966, 000	43. 9	[2] 17. 4
Woven goods over 12 inches wide (thousands of square yards):					
New England	2, 606, 664	3, 218, 756	2, 607, 368	23. 5	[2] 19. 0
United States outside New England	2, 503, 645	3, 594, 784	5, 134, 200	43. 6	42. 8
Value of products:					
New England	$229, 101, 000	$337, 324, 000	$655, 799, 000	47. 2	94. 4
United States outside New England	$221, 367, 000	$363, 977, 000	$1, 164, 087, 000	64. 2	219. 8
Value added by manufacture:					
New England	$90, 568, 000	$134, 624, 000	$272, 930, 000	48. 6	102. 7
United States outside New England	$73, 645, 000	$123, 158, 000	$414, 626, 000	67. 2	236. 7

[1] These figures do not include the cotton consumed by cotton small wares and cotton-lace industries. Cotton small wares for the United States consumed 21,339,000 pounds in 1925.

[2] Decrease.

The average number of persons engaged in New England cotton manufacturing was highest in 1919, when it was 218,059. This was nearly approached again in 1923, when the total was 215,447. This number was reduced in 1925 to 181,603.

COTTON WOVEN GOODS

The maximum production of cotton woven goods in New England was in 1914, when these States produced nearly 3,219,000,000 square yards of cotton cloth. The 1914 production was closely approached in 1909 and in 1923, when the totals were 3,194,000,000 and 3,144,000,000 yards, respectively. The marked curtailment in the years immediately following the World War was followed by a pronounced increase, so that the total yardage in 1923 was only about 2 per cent below the maximum of 1914. Production from 1919 to 1923 showed an increase of 343,000,000 square yards, but in consequence of price deflation the value of the woven goods produced fell off $135,800,000. The 2-year period from 1923 to 1925 showed the most pronounced change in yardage, with a decline of 17 per cent.

The year of maximum dollar values of woven goods was 1919, when values were greatly distorted by high war-time prices. In that year the New England product had a value approaching $700,000,000, which is almost three times the value of a much greater yardage in 1914. The value of the 1923 production was far higher than for any other year outside the war period. The total value in 1923, following the period of sharp postwar deflation, exceeded $563,000,000 and represented an increase of nearly $119,000,000 over 1921.

Total Production and Value of Cotton Woven Goods in New England States, Census Years 1909–1925

Census year	Thousands of square yards	Value	Census year	Thousands of square yards	Value
1925	2, 607, 368	$459, 897, 000	1919	2, 800, 535	$698, 910, 000
1923	3, 143, 581	563, 109, 000	1914	3, 218, 756	242, 821, 000
1921	2, 809, 820	444, 436, 000	1909	3, 194, 421	236, 904, 000

PRINCIPAL WOVEN FABRICS

The importance of the principal woven fabrics, as shown by their value in 1925, was in the following order: (1) Twills and sateens, (2) tire fabrics, (3) sheetings, (4) cotton and silk mixtures, (5) shirtings, (6) lawns, nainsooks, cambrics, and similar muslins, (7) cotton flannel, (8) ginghams, (9) print cloth. The value of each of the first four of these exceeded $40,000,000 and for each of the others it exceeded $20,000,000.

In terms of yardage the principal fabrics were in the following order of importance: (1) Twills and sateens, (2) sheetings, (3) print cloth, (4) tobacco cloth, cheesecloth, etc., (5) lawns, nainsooks, cambrics, and similar muslins, (6) shirtings, (7) cotton flannel, (8) cotton and silk mixtures, (9) ginghams, (10) tire fabrics. Production of each of the first five of these exceeded 200,000,000 yards, that of the next four exceeded 100,000,000 yards each, and that of tire fabrics was nearly 91,000,000 yards.

The relative position of the important fabrics of New England manufacture in the value of the whole national output is shown in the following percentages contributed by New England: (1) Cotton and silk mixtures, 79.3 per cent; (2) lawns, nainsooks, etc., 73.6 per cent; (3) tobacco cloth, cheesecloth, etc., 59 per cent; (4) twills and sateens, 52.7 per cent; (5) bedspreads and quilts, 51.3 per cent. New England manufactures thus contributed over one-half of the total national value in each of these fabrics.

Between 40 and 50 per cent of the total national value was contributed by New England in cotton flannels (48.4 per cent), shirtings (45.3 per cent), and ginghams (43.4 per cent). Woven fabrics in which the value of the New England production was overshadowed by production in other parts of the United States were sheetings (23.7 per cent), print cloth (21.8 per cent), plush, velvets, etc. (15.7 per cent), denims (13.6 per cent), and towels, toweling, etc. (5.7 per cent).

COTTON WOVEN FABRICS PRODUCED IN NEW ENGLAND IN 1925

Kind of fabric	Value of products		Quantity produced		
	Millions of dollars	Per cent of United States total	Square yards	Per cent of United States total	Rank in yardage produced
Twills and sateens	44.3	52.7	274,709,000	51.6	1
Tire fabrics	43.4	41.1	90,937,000	37.6	10
Sheetings	42.7	23.7	270,166,000	16.5	2
Cloth of cotton or other vegetable fiber and silk	41.0	79.3	147,367,000	83.2	8
Shirtings	34.3	45.3	156,852,000	34.4	6
Lawns, nainsooks, cambrics, and similar muslins	31.9	73.6	215,967,000	66.2	5
Cotton flannel	25.9	48.4	156,002,000	45.8	7
Ginghams	25.0	43.4	145,493,000	40.8	9
Print cloth	21.4	21.8	257,097,000	22.0	3
Tobacco cloth, cheesecloth, bunting, and bandage cloth	9.6	59.0	245,831,000	54.4	4
Bedspreads and quilts	8.6	51.3	24,983,000	47.5	12
Plushes, velvets, etc	6.4	15.7	7,954,000	23.8	11
Denims	6.3	13.6	22,950,000	12.7	14
Table damask	5.3	42.5	24,576,000	46.0	13
Tickings	2.5	23.8	10,826,000	22.4	15
Towels and toweling	2.2	5.7	8,443,000	6.7	16
Drills	1.6	3.8	8,385,000	2.9	17
Cottonades	.6	7.8	2,248,000	7.7	18
Undesignated woven fabrics (over 12 inches wide)	106.9	43.6	536,944,000	47.7	----------
Total woven goods	459.9	36.9	2,607,368,000	33.7	----------

CHANGES IN INDIVIDUAL WOVEN FABRICS, 1921 TO 1925

Since the period from 1921 to 1925 includes the years of greatest readjustment in New England cotton manufacture, changes in types of product during these years has a great deal of significance. In this 5-year period the total annual New England production of cotton woven cloth showed a reduction of 7.2 per cent in yardage but an increase in value of output of 3.5 per cent. The production for the entire United States for the same period showed an increase in yardage of 15.5 per cent and an increase in value of 30.1 per cent. From 1923 to 1925 the total yardage produced in New England fell off 17.1 per cent, and the value of the product decreased 18.3 per cent; during the same time there was a decline of 6.3 per cent in the total yardage produced in the United States and of 11 per cent in the total value.

In New England the fabrics which showed the most conspicuous increases in value from 1921 to 1925 were cotton and silk mixtures, table damasks and plushes, twills and sateens, and a large group of undesignated fabrics. Cotton and silk mixtures, with a product valued in 1925 at $41,000,000, showed an increase of 227 per cent in value as compared with 1921. Twills and sateens, with a product in 1925 valued at more than $44,000,000, increased 32 per cent in value; cotton flannels, with a product in 1925 worth nearly $26,000,000, showed an increase in value of nearly 31 per cent, as compared with the output of 1921.

Of the fabrics that were secondary in value in 1925, tobacco cloth and cheesecloth increased 48 per cent, while plushes, velvets, etc., more than doubled. Among fabrics of minor value the increase in table damask stands out prominently, the figures showing about 150 per cent increase over its 1921 value and more than 200 per cent increase in yardage, in comparison with relatively slight increases for the United States as a whole. Shirtings, the 1925 value of which in New England was upward of $34,000,000, showed an increase of approximately 6 per cent, but this was overshadowed by a national increase of over 46 per cent.

The most conspicuous decrease in values was shown by ginghams. The 1925 product, valued at nearly $25,000,000, showed a falling off of 53 per cent from the value of the production in 1923. Lawns, nainsooks, and similar fabrics, with a product valued in 1925 at nearly $32,000,000, showed a falling off of 37 per cent, in comparison with a reduction of 26 per cent for the country as a whole. A pronounced falling off was shown also in tire fabrics, whose 1925 value of $43,400,000 shows a reduction of over 30 per cent from that of 1921, in contrast with an increase of 4 per cent for the country as a whole. Print cloth, with a value in 1925 upward of $21,000,000, shows a decline in New England of 23 per cent, in contrast with a national increase of 20 per cent.

Of the fabrics of lesser value in New England, toweling declined more than 28 per cent and drills over 22 per cent, each of these being in contrast with substantial increases in value for the national production. The total value of denims, sheetings, and tickings each declined somewhat less than 10 per cent, while for the country as a whole the value of denims increased 50 per cent, that of sheetings 14 per cent, and of tickings 12 per cent. On the other hand, the large group of undesignated woven fabrics, amounting to nearly $107,000,000 in 1925, showed an increase of value in New England of 42 per cent, as compared with 1921, and in the country as a whole an increase of 57 per cent.

The following table shows the changes in individual fabrics, both in yardage produced and in value of product, for the period from 1921 to 1925, and also for the shorter period from 1923 to 1925, the change in each case being given as a percentage of the earlier year.

CHANGES IN YARDAGE AND VALUE OF VARIOUS COTTON-WOVEN FABRICS PRODUCED IN NEW ENGLAND AS COMPARED WITH THE ENTIRE UNITED STATES, 1923–1925 AND 1921–1925

Kind of fabrics	Percentage change[1] in yardage produced				Percentage change[1] in value of product				New England value in 1925 (millions of dollars)
	1923–1925		1921–1925		1923–1925		1921–1925		
	New England	United States	New England	United States	New England	United States	New England	United States	
Twills and sateens	−4.8	8.9	17.2	38.8	−16.2	−8.1	32.4	62.3	44.3
Tire fabrics	−7.0	6.9	51.2	153.1	−20.2	− .4	−30.5	3.9	43.4
Sheetings	−17.9	−3.4	−23.4	2.3	−14.9	−13.4	−6.9	14.0	42.6
Cotton and silk mixtures	12.2	17.4	330.9	384.4	−10.2	.7	227.5	265.0	41.0
Shirtings	26.6	33.5	−6.5	51.4	11.9	4.7	5.8	46.5	34.3
Lawns, nainsooks, etc	−19.4	−11.2	−31.2	−16.9	−31.2	−24.4	−36.8	25.8	31.9
Cotton flannel	−17.5	−10.7	4.4	15.5	−25.5	−23.0	30.8	42.2	25.9
Ginghams	−41.7	−37.6	−51.2	−33.[illegible]	−47.7	−42.2	−53.1	−34.5	24.9
Print cloth	−52.8	−26.1	−40.9	.8	−54.6	−31.7	−23.4	20.0	21.4
Tobacco cloth, cheesecloth, etc	−3.5	12.3	60.3	64.7	−32.7	−19.1	47.8	62.3	9.6
Bedspreads, etc	6.2	47.5	25.6	65.4	−3.7	23.3	18.1	51.8	8.6
Plushes, etc	1.2	20.8	100.9	190.9	−8.3	14.2	106.3	181.7	6.4
Denims	−34.1	−20.0	−24.9	7.4	−39.6	−24.4	−8.8	50.2	6.2
Table damasks	204.3	30.7	212.2	24.0	125.5	14.7	149.7	15.7	5.3
Tickings	−16.1	9.6	--------	3.9	−20.0	−10.0	--------	12.1	2.4
Towels, etc	31.5	3.2	−52.1	5.5	70.9	4.0	−28.5	22.5	2.2
Drills	35.2	5.7	−56.1	49.2	−33.7	−9.4	−22.4	92.4	1.6
Cottonades	28.8	39.0	--------	26.8	−37.6	28.2	--------	35.3	.6
Undesignated	−3.7	6	4.9	26.0	4.2	3.5	42.3	57.0	106.8
All woven cloth	−17.1	−6.3	−7.2	15.5	−18.3	−11.0	3.5	30.1	459.8

[1] Percentages are based on data for the first year mentioned in each column. Decreases are indicated by minus sign; other percentages indicate gains

USE OF RAYON IN NEW ENGLAND TEXTILE INDUSTRIES

The development of rayon and its use in the textile industries constitute one of the marvels of the present decade. While rayon is a fiber distinct from cotton, wool, or silk, it is used principally in conjunction with these other fibers, although recently fabrics made wholly of rayon have become prominent, especially in knitted wear. Rayon is not to be considered a competitor of cotton-mill products, because this new fiber simply replaces some of the cotton as raw material in the cotton mills.

New England textile manufacturers have shown a good deal of enterprise in the employment of rayon. The greater portion of its consumption in New England is in conjunction with cotton in making fine goods and novelty patterns. From reliable sources it is estimated that the country's cotton mills during 1927 used about 24 per cent of all the rayon consumed in the United States, and that New England mills used approximately 60 per cent of the rayon consumed by all the cotton mills of the country.

Over half of the New England rayon consumption is accounted for by the cotton mills. Manufactures of broad silks come next in importance, and plants making knitted hosiery and underwear consumed slightly less than the silk establishments. One of the recent great advances in the use of rayon is in the manufacture of various types of pile fabrics, including velvets, transparent velvets, and plushes. Many of the mills which manufacture these fabrics are located in New England. The apportionment of the total rayon consumption of New England in 1928 among the various textile industries is estimated to be approximately as follows:

	Per cent of total New England consumption
Cotton mills	53
Broad silks	14
Narrow fabrics	8
Hosiery	7
Underwear	6
Transparent velvets	5
Miscellaneous	7

The estimated volume of rayon consumption in each State, its proportion of the New England total, and New England's share in the national consumption in 1927 and in 1928, are presented in the following table. These figures should be considered only as careful estimates, as they are based upon incomplete records; but they are believed to be approximately correct. During 1928 the New Bedford textile strike greatly affected rayon consumption within New England, particularly in Massachusetts. No doubt this situation is principally responsible for the decrease in New England rayon consumption as compared with 1927. Under normal conditions the rayon consumption in New England in 1928 would probably have shown an increase, although it is believed that the increase would have been slightly below the increase in the country as a whole, which was approximately 10 per cent.

Estimated Consumption of Rayon by Individual New England States in 1927 and 1928

State	Consumption in 1927		Consumption in 1928	
	Pounds	Per cent of New England total	Pounds	Per cent of New England total
Massachusetts	9, 029, 000	46. 1	7, 549, 000	42. 1
Rhode Island	4, 936, 000	25. 2	4, 873, 000	27. 2
Connecticut	3, 486, 000	17. 8	3, 387, 000	18. 9
Maine	1, 136, 000	5. 8	1, 104, 000	6. 1
New Hampshire	999, 000	5. 1	971, 000	5. 4
Vermont	7, 000		8, 000	
Total	19, 593, 000	100. 0	17, 892, 000	100. 0
United States total	99, 254, 000		110, 568, 000	
New England as per cent of United States		19. 7		16. 1

Although no exact figures are obtainable for other years, the following estimates from a reliable authority, based on consumption in 1927 and 1928, give an approximate picture of the increase in consumption of rayon from 1919 to 1926, both in New England and in the United States as a whole. The increase in its consumption in textile industries outside of cotton manufacture was probably more gradual in New England during this period than in some other sections of the country, especially where the knit-underwear industry is important. In this line there has been a pronounced increase in the consumption of rayon.

Estimated Annual Consumption of Rayon in New England and in the United States, 1919–1926

[Thousands of pounds]

Year	New England	United States	Year	New England	United States
1926	11, 586	64, 730	1922	4, 742	26, 494
1925	10, 598	59, 210	1921	3, 342	18, 670
1924	7, 197	40, 206	1920	2, 166	12, 100
1923	7, 011	39, 167	1919	1, 670	9, 330

SOURCES OF RAYON PRODUCTION

In the production of rayon New England has been recently assuming some importance, with three concerns actually producing rayon in 1928, and with an output estimated at 2,000,000 pounds—approximately 2 per cent of the total United States production. Prospective increases indicate a probable doubling of this production in New England in the near future, with an increase in the number of New England producers of rayon to five concerns.

The production of rayon in the United States has had a remarkable growth in recent years. In 1927 the United States produced 77 per cent of the rayon consumed in this country, but in 1928 over 90 per cent of the total United States consumption was of domestic production, with a proportionate falling off in imports. While in

1928 the national consumption increased 11.4 per cent over that of 1927, there was an increase of 29.2 per cent in national production.

MARKETING AGENCIES FOR COTTON MANUFACTURES

The system for marketing cotton-mill products differs from that for some other commodities because the greater portion of the output must pass through further processes of manufacture and through intermediate handlers. Only a small part enters into final consumption in the form in which it leaves the mill. The unfinished gray goods generally require further processing, which includes bleaching, mercerizing, dyeing, printing, and various finishing processes that are determined by the desired pattern.

According to a study[1] by the Harvard Bureau of Business Research covering the billings in 1924 by manufacturers of about two-fifths of the national production of yarn-dyed and gray goods, 57 per cent of their output was subjected to further manufacturing processes after leaving the mill, while 43 per cent of the output was marketed directly to cutters-up and other industrial manufacturers. Considerably more than half their total yardage thus required further finishing. The study showed that about 34 per cent of the entire mill output was sold to converters and that 23 per cent was processed for the mills' own account.

Three distinct types of distribution agencies intervene between the cotton manufacturer and the final consumer. The first of these has to do with disposing of the unfinished goods as they come from the mill. The second type undertakes the necessary steps for converting these goods into the kind of finished product desired by the market. The third makes distribution of the finished goods to the final consumers or to manufacturers of wearing apparel and makers of other products who use cotton fabrics. While there is some degree of overlap in the functions of these three types of agencies, the general market is organized quite distinctly on this basis.

In New England the cotton-mill organization and personnel are generally quite distinct and independent from the organization for marketing the output. The mill treasurer is the principal business executive in the operation of the mill. He conducts the financial activities required in operation of the plant, buys the raw materials, and determines the form of manufacture. The physical operation of the mill is in the hands of the mill superintendent or manager, who conducts the plant under the direction of the treasurer. Disposal of the manufactured product is generally under control distinct from that of the plant management.

THE SELLING AGENT OR COMMISSION HOUSE

Sale of the mill product is made through a separate marketing agency known in the trade as the selling agent or commission house. This agency is, in fact, the sales department of the mill. It devotes its whole attention to selling, and generally has exclusive control of marketing the product. It keeps in touch with market conditions and carries on advertising and sales promotion for the mill. In earlier years the prevailing method of marketing cotton-mill products was by consignment to a central market, and sale at auction. The present system of marketing through an exclusive selling house is the outgrowth of the earlier form, wherein a single agency assumes continuous charge of all sales. Most of the large commission houses have their headquarters in New York City, which is the principal market for direct mill sales. Many of these houses have their correspondents in the important textile manufacturing centers.

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[1] Distribution of Textiles, Bulletin No. 56, Cambridge Mass., 1926.

In addition to its primary service of finding customers for the mill product, the selling house performs an important financing function by assuming the credit risk on sales and by making money advances to the mill for stocks manufactured in anticipation of orders. Competition among commission houses for the more desirable mill accounts in the past has led many of them to become financially interested in the mills which they represent.

THE CONVERTER

Despite the apparent meaning of the name, the converter is a merchant rather than a manufacturer. This agency has a highly specialized function in the marketing of cotton goods and plays an extremely important part in their sale. For the last 50 years the converters have been a major factor both in the manufacture and in the marketing of cotton textiles. The converter purchases the gray cloth or yarn-dyed fabrics as they come from the mills, and arranges to have them put through the further processes necessary to finish them for the market. He thus undertakes most of the burden and the risk in selecting the style and finish of fabrics for the final consumer.

The converter is the marketing agency that stands between the selling house of the mill, on the one hand, and the distributors or users of finished fabrics, on the other. Most of the converters arrange to have their goods processed and finished, under contract, by plants which specialize in the kind of process that is required; but some of the larger converters operate their own finishing plants. In recent years there has been a growing tendency among the larger cotton manufacturers to take over the functions of the converter and to have their goods finished for the final market on their own account, either in their own plants or in outside finishing plants.

FINAL DISTRIBUTION

There are several kinds of outlets for finished cotton fabrics. On the one hand are the garment manufacturers and other makers of apparel, draperies, and other products, who purchase the finished goods in large lots and make them up into articles for direct consumption. This outlet is designated as the cutting-up trade. There is a similar type of outlet among the manufacturers in other industries, who use cotton goods in connection with the manufacture of products such as shoe linings, tire fabrics, and numerous other articles. These may be designated as industrial consumers. In addition to these are the various wholesaling and retailing agencies which handle piece goods.

According to the Harvard study referred to on page 301, the industrial users and the cutting-up trade together absorbed more than half of the total billings of cotton piece goods by representative mills of the country as a whole, while the retail trade accounted for somewhat more than one-third. The relative importance of individual outlets was indicated in that study by the following percentages of total billings: Retailers, 36 per cent; industrial users, 30 per cent; cutters-up, 26 per cent; exporters, 6 per cent; institutional outlets, such as hospitals, 2 per cent.

Of the sales made directly from the mills those to cutters-up and industrial users comprised slightly less than 25 per cent of their total billings, and direct sales to wholesalers, retailers, and exporters comprised 20 per cent of the total. In this latter portion direct sales to wholesalers comprised approximately 14 per cent and only 1 per cent was made direct to retailers, while 5 per cent was to exporters. Of the goods that were finished for the manufacturers' account before sale, however, the portion to wholesalers was considerably greater. Here the proportions to different outlets were as follows: Wholesalers, 46 per cent; cutters-up and other manufacturers, 38 per cent; hospitals and unclassified customers, 7 per cent; retailers, 4 per cent; exporters, 5 per cent.

In the past wholesalers have been an important factor in insuring the regularity of mill operation through the placing of advance orders for merchandise, which ranged all the way from one-fourth to three-fourths of their total purchases. There are two main groups of these wholesalers, the first comprising the large wholesale merchants which do a national business, while the second group is made up of firms which serve the retail trade in their local territory.

In the distribution of piece goods to the retail trade the prevailing channel has been through the wholesale houses, with only a small amount from converters and a very slight portion directly from the mill. The Harvard study of sources of purchase by retailers found that 89 per cent of the total purchases by retailers were made from wholesale distributors. Their purchases of finished goods from converters and manufacturers comprised 8 per cent; and purchases of gray goods and yarn-dyed fabrics directly from the manufacturers were only 3 per cent.

The large metropolitan department stores, which are a very important outlet for piece goods, usually place their initial orders with converters and manufacturers at the beginning of each season, and place their later fill-in orders with local wholesalers. Purchases by the large mail-order houses are made from the converters or directly from the mills. The same is true of purchases of piece goods by chain-store organizations. Small department stores and general merchandise stores purchase cotton piece goods principally through wholesale dealers.

IMPORTANCE OF VARIOUS OUTLETS

There is a considerable variation in the importance of outlets for different kinds of fabrics. The Harvard study found that in the marketing of prints, voiles, marquisettes, lawns, shirtings, twills, and sateens, the converter was the prevailing outlet. In these fabrics four-fifths of the manufacturers' billings were made to converters;

one-tenth went to cutters-up; and only one-tenth to industrial manufacturers, wholesalers, and exporters together. With materials for fine and fancy mixed goods, also, converters received four-fifths of the total billings, and wholesale dealers one-fifth. The bulk of the billings of pile fabrics was likewise to converters.

In some other fabrics, however, the principal outlet for the manufacturer was direct to wholesalers. Most of the billings of ginghams went to this outlet, as well as appreciable billings of flannels; of drills, cottonades, and cotton suitings, a considerable portion of the billings was made to exporters; but for drills, denims, flannels, and cottonades, the principal outlet was to the cutting-up trade. In domestics, such as sheetings, pillow casings, bedspreads, and table damask, no single outlet predominated; of the total billings of these fabrics one-third was made to converters and one-third to wholesalers. Of the rest one-fifth was billed to other manufacturers, one-tenth to exporters, and the remainder to cutters-up and retailers.

CHANGES IN DISTRIBUTION

The changes in the distribution of cotton goods in the last few years are largely the result of (1) changes from buying for stock to small-order buying for current requirements; (2) changes from piece goods to ready-to-wear garments; (3) greatly increased importance of the style element.

A period of small-scale buying, originating generally with retailers during the crisis of 1920, was inspired by the attitude of caution in both the wholesale and retail trade, arising from the shrinkage of inventory values in a period of rapidly declining prices. Continuous fluctuations, both in the price of raw cotton and in that of cotton cloth, have encouraged the continuance of this cautious attitude. It has been strengthened by the facilitation of quick deliveries, resulting from improvements in transportation facilities.

A general trend toward smaller orders was noticeable, however, before 1917, and early periods in cotton manufacture have witnessed major fluctuations in size of orders. Systematic attention on the part of retailers to increase the rate of merchandise stock-turn, particularly in department stores, has made them active in carefully controlling purchases and inventories. According to the Harvard study previously mentioned, orders received by the cotton mills and selling agents were distinctly smaller in 1924 and 1925 than from 1921 to 1923. The orders from wholesalers showed less variation than those from cutter-up and mail-order houses.

The small-scale placing of orders has been accompanied by a great change among consumers from cotton piece goods to ready-to-wear apparel. Wholesalers are generally agreed that the sale of piece goods in the smaller trading centers has suffered in consequence of the good roads and the general use of automobiles in the rural districts. This has generally resulted in concentration of the piece-goods trade in the larger centers. The decline in sales of piece goods makes the function of the wholesaler less essential and, in consequence, he has become increasingly a service agency for taking small fill-in orders.

Records of 10 representative department stores located in the East, South, and Middle West, for a period from 1911 to 1925, show that the change from piece goods to ready-to-wear clothing prevails in the large cities as well as in the small centers. Relative sales of cotton piece goods showed a continuous and pronounced increase from 1913 up to 1920, and a general decline from 1920 to 1925. Ready-to-wear goods, on the other hand, showed a continuous advance after 1914, with the exception of 1921 and 1922. The advance in sales of ready-to-wear clothing was greater than that of cotton piece goods for all but two years of the whole period, as is shown in the following table.

Relative Sales (by Value) of Cotton Piece Goods and Ready-to-Wear Goods by 10 Department Stores in the East, South, and Middle West, 1911–1925

[Index number, 1913=100]

Year	Cotton piece goods	Ready-to-wear clothing	Year	Cotton piece goods	Ready-to-wear clothing
1911	90	85	1919	195	210
1912	95	95	1920	250	215
1913	100	100	1921	210	200
1914	95	100	1922	180	205
1915	90	120	1923	200	220
1916	100	140	1924	185	215
1917	110	145	1925	155	225
1918	135	145			

Source: Distribution of Textiles. Harvard Bureau of Business Research, Bulletin No. 56. 1926.

Superimposed on the two factors of small-scale buying and change to ready-to-wear goods, there has been a third vital factor—that arising from the increased rapidity and intensity of style fluctuations. This is shown by the decline in the sale of certain standard fabrics, such as white goods and wash goods generally, and by the great increase in number of designs and patterns of goods offered for sale. These style changes have brought about a merchandising problem of great importance to the cotton manufacturer.

Conservatism in buying policies and the increased frequency of purchases, as a result of rapidly changing styles, have resulted in smaller average stocks of individual patterns by department stores and other retailers, which has meant smaller purchases of each item. The problem of small orders for quick delivery has meant for the manufacturer an increased risk of loss through depression of merchandise, resulting from a drop of prices or change of style, in case he should undertake to keep his plant operating at full capacity by manufacturing for stock.

The only alternative for the manufacturer has been a radical adjustment in his scale of plant operation. These changes in buying policies have thus been a serious burden to the manufacturer, without compensating advantages. The process of readjustment to these new conditions has now been on its way for some time, but it requires time to bring it to completion. The factors are beyond the control of any one agency in the manufacture and distribution of cotton goods; they present a mutual problem whose solution depends upon the readjustment of manufacturing and marketing methods to meet these new merchandising conditions.

NEW FACTORS IN PRESENT SITUATION

While there have been no radical changes in the processes of cotton manufacture in recent years (except the rise and development of rayon) a number of new elements have entered into the situation, which confront the New England manufacturers with special problems. Some of these problems arise from the excessive competition that has grown up in this whole industry as a consequence of its capacity to produce beyond the consumption requirements of the present market. This gives a competitive advantage to manufacturers who can produce most cheaply and efficiently—in other words, to plants having the lowest cost of production. This must take into account the various factors which enter into the cost of making cotton goods.

COMPETITION

The intense competition in cotton goods during the last few years has put every mill to a severe test of its ability to meet present conditions in production and marketing. This has been true not only in New England but in the cotton-producing States of the South. It has been even more drastic in the British cotton industry than in the United States. Some New England mills have been able to hold on under adverse conditions only because of accumulated surpluses from past operations. It is obvious that continuance at a loss under these conditions, even though possible for a time, is an uneconomic proceeding.

During this period of adjustment many New England spindles and looms have gone out of production, some of them temporarily, and many of them permanently. The field of activities has become concentrated in a smaller number of mills favorably situated.

The conditions of the last few years are serving to redistribute the industry and to concentrate it in mills that have stood the test of competitive ability. In general, the mills which have fared best are (*a*) those favorably situated in respect to power, either from local water power, purchased electric power, or cheap tidewater coal; (*b*) those with well-arranged plants and the most efficient equipment; (*c*) those under the most intelligent and most skillful management; (*d*) those which have given special study and attention to the market for their product.

The difficulty of ascertaining exact production costs, with all the variable factors that enter into the manufacture of cotton goods, has been a handicap to the industry. It has undoubtedly been true that some of the older mills with partially obsolete equipment or with unfavorable location in respect to power, transportation, and working conditions, could not be operated profitably under stiff competition. Many favorably situated New England mills, however, have continued to compete successfully with other sections, particularly in the making of the fine goods for which New England mills have built up a reputation. Numerous mills have demonstrated their ability to operate profitably even under the adverse conditions of the last few years.

In contrast to relatively slight changes in the factors of production, pronounced changes in marketing and distribution of the product of cotton mills have forced special emphasis upon market organization. The most radical changes are in the manner of distributing goods. Along with drastic curtailment in the consumption of cotton fabrics, there have come revolutionary changes in the types of cotton fabrics that are wanted by consumers. With the strong buyers' market that has prevailed in the last few years, the advantage has lain with the manufacturers who catered to that demand.

CHANGES IN DEMAND

In place of the staple cotton fabrics upon which New England cotton mills built their fortunes, the market has turned largely to novelty goods and specialties, in which style, beauty, and design are the primary requisites, rather than durability and quality. The great change in types of fabrics consumed is exemplified in the extensive use of silk fabrics and silk mixtures, and in the growth of rayon manufacture. These new materials and new types of fabrics have in large measure supplanted the old staple goods.

The increased importance of style in the selling of cotton goods makes it necessary that the manufacturer be able to adapt his processes quickly to changes of fabric. New patterns must be made and distributed in as brief a time as possible, for change is the very essence of style; hence, the time from the creation of a pattern to its offering on the final market must be reduced to a minimum. The mill must, therefore, be in instant readiness to make the necessary changes required for its manufacture. Moreover, the sales organization must keep in frequent touch with its customers, and it finds the former seasonal or semiannual trips to call upon the trade quite inadequate.

CHANGES IN DISTRIBUTION

In consequence of the rapid changes in style, and, in particular, because of the instability of prices in the last few years, great changes have taken place in distribution methods. Small-order buying of manufactured goods has taken the place of the seasonal purchases which were the prevailing practice among distributors in former years.

This has worked against the planning and operating of plants for continuous manufacture of standard lines for stock, which has been the basis of low-cost quantity production. When the consumption was prevailingly one of staple goods, manufacturers could make up large stocks of standard gray goods in anticipation of later orders. They were thus able to operate their plants continuously on a quantity production basis, without being disturbed by prospective changes in the type of goods required by the market. Likewise these gray goods could be finished for stock in large quantities in anticipation of later demand.

CHANGES IN OUTLETS

Besides these changes in conditions of distribution, there have been pronounced changes in the outlets through which cotton goods are distributed. In earlier years these goods found a market mainly for sale as piece goods through the wholesale and retail trade. The pronounced change in the market from piece goods to ready-to-wear garments has meant that an increasing volume of the output of the mills goes to garment manufacturers and others in the cutting-up trade for further manufacture into ready-made apparel, while a diminishing amount is sold through wholesale and retail channels as piece goods. This extends even to such articles as sheetings and toweling, which in many instances are now made up at the mill into sheets and pillow cases or towels, ready for the final user—a mill practice which was quite unheard of until the last few years.

The so-called hand-to-mouth buying, which has been attributed to postwar influences, but which actually was in progress before the war began, is a result partly of the rapid changes in demand arising from changes in styles, but it exists largely because of the instability of prices. In a prospective falling market the foresighted merchant finds it a sound business policy to make his purchases at frequent intervals in order to avoid the possibility of stocking up with goods at prices higher than those to be realized later. In this the manufacturer whose operations are scaled for quantity production finds a serious handicap. Many business men are of the opinion that such small-scale distribution is here to stay, while others hold it to be a passing practice that will disappear as distribution conditions become more stabilized. Whichever view may be the right one, it is a factor of serious consequence to manufacturers under present conditions.

CROSS-SECTION OF NEW ENGLAND COTTON INDUSTRY

The following summary of experiences by a number of New England cotton manufacturers during the past few years of adjustment is presented as the result of replies to special inquiries by the Department of Commerce, with the cooperation of the New England Council. These inquiries were sent to every manufacturer for the purpose of obtaining first-hand information regarding the conditions of production and marketing prevailing in the cotton-goods industry. In response to these inquiries, detailed statements were obtained from some 118 New England manufacturers of cotton woven goods. Ninety-five of these replies contained figures of sales and employment from 1921 to 1925. The aggregate sales of these 95 concerns in 1925 were $283,000,000 and the total number of persons employed was approximately 67,000. The sales thus reported represent 51 per cent of the total value of cotton woven goods produced by all New England manufacturers as reported in the 1925 census and give a very good cross-section of the manufacture of cotton woven goods in New England during that period.

The reports from these companies cover a wide variety of fabrics, in which the finer types of goods predominated. One-quarter of the replies designated the product simply as cotton cloth and yarn, or gray piece goods; the others indicated a great number of specialty fabrics. The range of fabrics covered practically all the types mentioned in the foregoing discussion. In the total number of 118 concerns, 71 indicated the concentration of their efforts upon a single type of fabric, and 47 reported the manufacture of multiple types or of supplementary goods in addition to the specified main product.

SIZE OF ESTABLISHMENTS

The average of sales in 1925 for the 95 plants giving figures was $2,980,000. Fifty-three of these reported sales between $1,000,000 and $5,000,000; 38 companies had sales ranging between $100,000 and $1,000,000, and 15 of these exceeded $500,000. There were 11 companies which reported individual sales in excess of $5,000,000 each; 5 of these exceeded $10,000,000 each, running up to a maximum of nearly $50,000,000. These 11 large concerns accounted for over one-half of the total sales reported by the 95 companies.

The average number of employees per plant for these 95 concerns was approximately 700 persons. There were 33 concerns whose average employment through the year ranged from 100 to 500 persons; there were also 18 companies employing fewer than 100 persons each. Employment of 500 to 1,000 workers was reported in 27 of the replies. There were 17 of the largest concerns each of which had over 1,000 employees, and these 17 companies account for 57 per cent of the total employment reported by the whole 95.

The prevalence of large-scale operations in the manufacture of cotton woven goods is very evident from these replies.

AGE AND MANAGEMENT OF PLANTS

Of 111 replies regarding the date of establishment, there were 45 which indicated that their plants had been in operation from 50 up to 100 years; and there were 8 companies which reported continuous operation for more than a century. Four of the five largest establishments, each of which exceeded $10,000,000 in 1925 sales, had been in continuous operation upward of 50 years. There were 41 companies whose plants had been in operation between 10 and 50 years. In addition to the older establishments there were 17 concerns of recent origin, having been in operation not more than 10 years.

Of 107 concerns stating the length of time the plants had been under present management there were 51 which reported an unchanged management for periods varying from 10 up to 50 years, and 6 other companies whose management had been unchanged for more than half a century. In contrast with these it is significant to note that 50 concerns, nearly one-half of the number reporting, stated that the management or control had been changed within the last 10 years; 17 of these had changed management between 5 and 10 years ago, and 33 had undergone a change within the last 5 years. A very considerable degree of change in the control of individual establishments is thus indicated.

There were 27 concerns which reported the operation of branches in addition to their main plant. Eighteen of these had branches in New England, and 9 others had branches in the Southern States. Of the concerns with New England branches 1 company had 7, another had 5 branches, 1 had 4, 1 had 3; 4 other concerns reported 2 branches each, and there were 10 other companies, each of which reported 1 branch. All these New England branches had been established before the World War and most of them had been under unchanged management for many years. Of the 9 New England companies which reported branches in the Southern States, there were 2 concerns each of which had 4 branch plants in the South, and 7 other New England companies with 1 southern branch each. These companies with branches in the South had been under their present New England management for a period ranging from 3 up to 21 years. Only 2 of the southern branches had been established prior to 1914; each of the others was established since 1923.

FACTORS INFLUENCING LOCATION

In order to find out the manufacturers' chief economic reasons for originally locating or for continuing in New England each one was asked to state the reasons which he regarded as most important. Many of the mills have been established so long that the present owners can not give the reasons which prompted their original location. Of those which stated definite reasons, nearness to market was emphasized in 29 replies and labor conditions in 28. Besides these two dominant reasons there were 18 replies which mentioned transportation facilities, 16 water power, and 15 which gave banking facilities as important reasons.

PLANT ACTIVITY

The extent of physical expansion in the New England cotton-goods industry in recent years is indicated to some degree by the proportion of the mills which have made additions to their total plant capacity since 1921. Increases in plant capacity were reported by 15 mills. These increases varied from slight additions in several cases to a doubling of capacity in two or three instances. Most of these increases took place in 1922–23, although a few were reported in 1924–25. Without exception, these reporting additions to plant capacity were manufacturers of textile specialties, and none of them were makers of single staple fabrics.

The degree to which the available capacity has been utilized is indicated by the ratio of the output in 1925 to the maximum possible capacity in that year. Ninety mills indicated this ratio in terms of their 1925 production; 49 of these stated that they were operating at 75 per cent or more of the maximum capacity, and 6 of these were at full capacity. Of the others there were 29 mills reporting operations from 50 per cent to 75 per cent of their maximum; and 12 were operating at less than one-half of capacity. The mills that had enlarged their physical capacity have apparently justified the increase by higher ratio of utilization than those that made no additions.

Naturally the concerns whose activities were at a high ratio of capacity were the ones showing increases in total sales. Yet among 21 mills whose individual sales decreased continuously from 1923 to 1925 there were 13 that reported operations in 1925 at 75 per cent or more of their maximum capacity. It is significant also that in the 32 mills reporting individual increases in sales in 1924–25, but a reduction below their 1923 sales totals, there were only 14 which reported operations in 1925 at 75 per cent or upward; 13 of them were operating in 1925 from 50 per cent to 75 per cent of their possible output, and 5 of these had less than 50 per cent. For all the

90 mills the output in 1925, in terms of a maximum possible output, was 74.1 per cent, this figure representing a weighted average of the total aggregate sales of the whole group.

TREND OF SALES OF INDIVIDUAL COMPANIES

Practically all the reporting companies showed increases in individual sales in 1923 as compared with 1921, and most of them had higher total sales in 1925 than in 1921. Of 82 mills which submitted continuous sales figures from 1923 to 1925 there were 27 whose sales volume in 1925 exceeded that of 1923. Eighteen of these fell back in 1924, while 9 of them showed a continuous increase. There were 36 other mills whose 1925 sales volume was greater than that of 1924, but less than that of 1923. Thus 63 of these 82 mills showed an advance in their individual sales of 1925 over those for 1924. There were 19 other mills, however, whose individual sales volume increased through both 1924 and 1925.

There was apparently no single factor to account for these individual differences in sales trends. No clear-cut distinctions are shown as to the method of marketing their products. Generally, however, the group of companies showing increases in sales volume includes the manufacturers of specialties and diversified products, while the group showing sales decreases includes, largely, the makers of plain staples. Thus mills which reported continuous advances in sales volume for the 1923 period of adjustment were generally either the manufacturers of specialty products and the finer staples or they had diversified their production and had adjusted it to changes in market requirements. The replies indicated that many manufacturers were concentrating their efforts upon meeting the changed type of demand and that a great deal of adjustment had already taken place by the end of 1925.

SOURCES OF RAW MATERIALS

The reports from these New England cotton mills indicated that the two chief materials used—raw cotton and rayon—are obtained principally from sources outside New England. Over one-half of the mills reporting indicated the use of rayon or silk, or of both rayon and silk, and these materials are purchased from a variety of outside sources. The mills purchasing cotton yarn, unfinished gray cloth, and cotton waste obtained these supplies mainly from within New England, although a considerable number of companies obtained their yarns from southern mills. Several of the reporting manufacturers complained of the handicap which they suffered as a result of fluctuations in the price of raw cotton. One of these men reported that the unsettled conditions of the raw-cotton market affected his business more than any other single factor.

LABOR AND EMPLOYMENT

The importance of labor in the New England cotton-goods industry is indicated by the fact that in 1925 wages paid to workers in New England cotton mills were equivalent to 63.2 per cent of the value contributed by the processes of manufacture outside the cost of materials, and represented 26.1 per cent of the total value of the product. For the rest of the country, outside New England, the payments to wage earners represented 50.5 per cent of the value added by manufacture and 17.6 per cent of the value of the product. The average annual wages of cotton workers of New England in 1925 was $963 and for the rest of the country $696.

The item of labor cost and labor efficiency is thus of particular concern to New England. Labor cost per hour or per day is not so significant as the cost per unit of product. Labor efficiency is closely related to plant management and plant equipment. New England has certain distinct advantages in the efficiency of its labor, which are partly a matter of acquired skill and partly the result of a climate that is favorable to continuous physical exertion.

Fluctuations in seasonal employment, resulting from changes in manufacturing activity at different times of the year, present serious problems, both to the mill managers and to the communities in which cotton manufacture is the predominating industry.

For the whole cotton-goods industry of New England the months of high employment in 1925 were from January to April, inclusive, while the low months were from July to September, inclusive. In that year the month of maximum employment, as shown by the number of persons on pay rolls, was March, with 175,337, and the lowest month was September, with 151,831. The monthly average for the year was approximately 165,000. The monthly variation in employment for the cotton-goods industry as a whole in New England, as shown by the difference between the month of maximum employment and that of minimum employment, was 14.25 per cent of the yearly average number of employees. For the United States as a whole, including New England, it was 7.15 per cent.

A number of mills have taken definite steps to overcome seasonal employment by diversifying their products, developing supplementary lines or manufacturing for stock, whereby they have made satisfactory progress in increasing the uniformity of employment throughout the year.

One of the ways in which management aids in promoting labor efficiency is by the adoption of properly designed incentive methods of wage payment, such as piecework or similar systems, which, by offering a financial reward to workers in proportion to their output, has a tendency to reduce unit labor costs. The proportion of employees paid by such incentive methods is noticeably high, as indicated by the reports of the representative mills making replies. Each mill was asked to state the proportion of its employees paid by piecework or other incentives, to those paid by the day or hour, together with the number of persons employed in January, April, July, and October, of 1923 and 1925.

For the group of 76 cotton mills giving this information, whose total average employment in 1925 was 66,000 wage earners, it was found that of this total number of workers 52.5 per cent were paid by piecework incentives. A considerable number of mills had 75 per cent or upward of their employees on this basis, and there were few reporting less than 35 per cent of their workers so compensated. The comparison of mills replying in the different States, as shown by a simple unweighted average of percentages, shows the following:

Connecticut, 64 per cent; Maine, 51; Massachusetts, 48; New Hampshire, 45; Vermont, 42; and Rhode Island, 39.

CHANGES AND IMPROVEMENTS IN MANUFACTURE

The greater portion of the mills reporting in this group indicated that various improvements have been effected in their manufacturing operations. Accident prevention was mentioned in the greatest number of cases. The other adjustments most frequently mentioned are changes in production methods, changes in type of product, and changes in selling practices.

Changes in production methods.—Regarding improvements in production methods, numerous replies indicated success in reducing the cost of manufacture through the installation of new labor-saving machinery or through increased efficiency of their workers by accident prevention or other means. One manufacturer of cotton piece goods, with sales in 1925 of $2,000,000, reported a reduction of 20 per cent in operating costs through the organization of production methods. The development of new processes whereby cheaper forms of raw material were made available is reported in another instance.

A maker of gray piece goods reports increased production with fewer operatives and higher wages as a result of rearranging and consolidating the employees' operations. In another instance the costs of production of certain styles were said to be reduced 15 to 25 per cent by rearrangement of jobs in the mills and by a better system of production control. Better knowledge of production costs and better feeling among workmen are cited as improvements effected by another cotton-goods manufacturer. These are but a few examples from many received.

Aside from changes in production methods through internal management of plants, active efforts to modify the type and quality of products are reported in numerous instances. One $5,000,000 company maintained production through the introduction of a varied line of rayon fabrics. Another large concern, making ginghams, toweling, and domestics, reports the addition of supplementary products in the line of finishing of yarn and cloth. Maintenance of production is obtained by another large manufacturer by diversity of cloth construction; and a mill whose chief output has been muslins reports diversification to include other styles of fabrics. A large maker of surgical gauze and cheesecloth reports that by diversification of product for sale to different classes of trade, and by a careful program of manufacture for stock, his mill has been able to keep employment and production regular and to have a continuous increase in sales each year since 1921. Lowered manufacturing costs and increased business, through the addition of new products, are reported by a small manufacturer of sheets and bedspreads. Many concerns making bedspreads have developed a line of rayon spreads in the last few years to meet domestic demands.

One of the larger mills making a variety of products reports that it has been driven by southern competition on coarse staple goods to make many specialties; the result of this has been better prices but less volume on any individual line. A medium-sized plant which changed from making plain cloths to fancy goods, such as handkerchief material, shirtings, and voiles, reports increased sales and more continuous operation as a consequence of its independence of variation in gray-goods values. In another instance a maker of mixed cotton, rayon, and silk specialties for corsets and lounging robes has found that the product of his mill has not followed the general variations of the textile business. Success obtained in developing specialized products in a field of less competition than that of the staples is reflected by another manufacturer who reports a change from making raw cloth to converted goods, such as dress goods and linings, which are sold direct to the cutting-up trade.

Statements by executives.—Leading executives in the cotton-textile industry were asked to make statements as to their policy regarding the installation of new equipment, and their opinion regarding the attitude of the New England industry as a whole in this respect. The general tenor of these statements is that the more progressive and prosperous cotton mills are fully alive to the importance of maintaining their equipment in the best possible shape. There is indication, however, that this attitude does not persist in some portions of the industry. Statements of some of the executives are reproduced below as direct quotations to indicate the attitude of the leaders among New England mills:

1. It has been necessary to adapt our equipment and plants in New England to the better quality of work which is most suitable for manufacture in this region. To this end we have during the past two or three years added to and changed our equipment to produce this character of product, although in the case of our mills this did not require the same radical changes as might be necessary in other companies for the reason that our general line of product fits to a remarkable degree the present demand for light-weight goods for both men and women, and cotton goods of varying character and style.

2. Our policy in regard to new and up-to-date equipment has been very liberal, in that we have installed new equipment very freely, having even spent more money in this direction than was proper under the business conditions and our general financial situation. In this connection we would call attention to the fact that the New England cotton industry has been unjustly criticized for failure to put in automatic looms. On the very fine yarns making style fabrics there is a reasonable doubt as to whether the automatic loom makes sufficient labor saving to compensate for the large additional cost, both initial cost and upkeep cost. This is further complicated on the fine-yarn goods by rapid style changes, making it necessary to scrap existing weaving equipment and put in new equipment. This, again, argues against the more expensive automatic looms. On medium and coarse goods, where the automatic loom is an undeniable benefit, the competition with the cheap-labor centers of the Southeast has tended to remove the manufacture of this type of goods from New England.

3. It has always been the policy of this company to keep our mills up to date in equipment, both as regards repairing machinery already installed in the mills and in replacing obsolete machinery as better machinery is brought out, whenever it is profitable to do so.

With regard to the attitude of the industry in general in New England on this subject we believe that the majority of the mills follow this principle, although some have been unable to do so because of their financial situation.

4. It is the policy of this company to keep its machinery as modern as possible. We have our plant in such shape that it could go a lifetime without replacement, if these replacements were not made necessary on account of improved machinery. We do believe, however, that our competitors in this field in New England are allowing their plants to depreciate, due to the fact that they do not make proper allowance in their costs for this depreciation or obsolescence.

5. We have the most up-to-date equipment, we believe, that is on the market with regard to winding, warping, and finishing. We have just put in new

finishing machinery, and installed a complete system of warping two years ago; purchased a warp tying-in machine at that time and, in fact, have bought everything that we can lay our hands on that will give better production and better material.

6. Our company has always felt under the necessity of keeping its plant and equipment in a high state of operating efficiency. We have also investigated every new machine and device in the textile or textile-finishing industry to see if it was economy to install it. Any machine which will pay for itself in two years is installed without question. Much new machinery is installed if it will pay for itself in five years. From an examination of quite a number of textile mills in New England we should say that we were in the upper quarter in that point of view. Many of the mills have machinery dating back to 1878, which was low in efficiency even 20 years ago.

7. During the last four or five years of depression in the cotton textile industry, it has been the policy of this company to keep their equipment up to date in all respects so that they might be in a position to take advantage of better times when conditions changed. Of course, we know that in some sections the machinery and equipment have been allowed to depreciate.

8. As to our policy in regard to the installation of new and up-to-date equipment, up to two years ago it was our policy for some years to spend from $200,000 to $300,000 annually on plant improvements in the way of replacing obsolete equipment. For the last two years, however, this has not been possible on account of our figures going into red.

The extent of reorganization that has been found necessary in individual instances is illustrated by the following statement from the executive of a large New England company, with several mills, which has undergone thorough reorganization in recent years:

> Recent improvements have resulted in the replacement of a widely scattered collection of plants of all degrees of usefulness by a more closely knit group of the most promising plants, augmented by the best machinery, etc., from the least promising plants which were gradually discarded as conditions determined. This elimination of "deadwood" brings to each surviving active plant a greater share in the attention of the management and permits a lower production cost for the company's products. General conditions were for the most part unfavorable during the period when this overhauling and revamping were taking place.

SELLING ORGANIZATION

Marketing mediums.—The commission house is still the principal single marketing medium for New England cotton mills making colored-yarn goods ready for the market, and for some important gray-goods mills which finish their own goods and market these through commission houses or through their own sales departments with headquarters in New York. A majority of other gray-goods mills sell their products direct to the converting trade and the large cutting-up trade through brokers. A few mills have New York selling offices, but their sales representatives sell largely through outside brokers. The commission houses that sell the gray-goods products of a few New England mills also sell in part through outside brokers.

In the case of mills whose product is sold through commission houses, selling methods are wholly in the hands of the selling agents.

Advertising.—The commonest medium of advertising was said to be the trade journal; a few manufacturers reported the use of newspaper advertising, and several of them advertised their product by means of direct mail.

The average advertising costs, as reported by 70 representative mills, was two-tenths of 1 per cent of the aggregate value of their sales in 1925, while the reported selling costs, exclusive of advertising, were 3.4 per cent.

Use of trade-marks.—Of 77 concerns which indicated their practice regarding the use of trade-marks, there were 40 which identified all or a portion of their product by this means. Almost an equal number, 37 concerns, stated that none of their goods were trade-marked. Of those which made use of trade-marks, 15 reported that their entire output was so identified. In numerous cases the manufacturer reported that his concern did no advertising, but that the product of the mill was trade-marked as a whole or in part.

Sales plans.—Typical examples of general sales plans in use by representative mills were obtained from a few leading executives. A number of these plants which sold their products solely through selling agents required no special sales organization. While it is apparent that many mills find such arrangement satisfactory, it is evident that millmen are not unanimous on this score, as is indicated in the following statement from one mill executive:

> Our product is sold exclusively through one commission house, with whom we are under contract to dispose of our entire product. We feel, however, that at the present time this is one of the greatest problems, and there is a very open question in our minds as to whether we are pursuing the best policy under the present market conditions. Our commission house has eight salesmen who are paid on a salary basis, and each man is assigned a definite section of the United States to cover. In Chicago and Boston we have branch offices with two local people in each office.

Sales plans followed by some large mills which have their own selling organization are indicated, along with reference to significant changes which they are facing, in the following statements by executives of typical mills:

> 1. The general sales plan which our mills have been following since September 1, 1926, is to sell goods under our own name with our own merchandising organization. Our former commission house, however, is continuing as selling agents, and as such is manager of our merchandising department. At the present time we have approximately 50 salesmen who are classed as such, and they are paid a straight salary. We are making changes in the matter of assigning territories, so that I do not know that we would have anything of special interest to contribute. The change in the character of product and demand for textile fabrics has brought about the necessity of a radical change in our merchandising and selling methods, and this we are putting into effect just as fast as conditions will permit.
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> 2. Our general sales plan is to sell our product principally through the office of a New York company, which is maintained for that purpose. Sales are made almost entirely through that office to converters. We do not attempt to sell through jobbers, wholesalers, or retail stores, and our goods are put out almost entirely in the gray form, not finished. There are only a few salesmen, and their market is almost—practically entirely—New York City amongst the converting trade, which is centered there.
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> 3. We have a very small line of customers, selling only to the cutting-up trade. Maintain offices in Chicago, New York, and Hyde Park, handling all employees on a salary basis. Have a commission agent in Los Angeles who does a limited business. Do no advertising, but plan on keeping in direct touch with our customers and giving them the best service possible.
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> 4. We have five regular salaried salesmen and two commission men. Our market is three-fourths in the jobbing trade. Being a small organization, we have maintained the personal touch, both in the assigning of territories and in the studying of the market; while we believe that the compensation of salesmen should be based on gross profits from their sales, we have not yet made the change from direct salaries to that form of compensation.

5. Our products are sold through salesmen traveling from branch offices where warehousing facilities are maintained. The branch managers continue to sell and are always picked from our more experienced salesmen. There is no particular plan for the assigning of territories. Geographic considerations, transportation, personality, and efficiency of branch offices have their bearing. All salesmen work on budgeted quotas and receive with branch-office managers bonuses based on the excess of their quotas. Contests and prizes are used to sustain interest, enthusiasm, and initiative. Market conditions are studied by salesmen's reports, investigations made through advertising agencies and others, by specially detailed salesmen, and by curves and tendencies as shown through statistics accumulated and tabulated in a department one of whose important functions is precisely that.

We have in the New York office five salesmen who cover the eastern section of the country. We have one agent in Cuba and one agent in the Philippine Islands. In the Chicago office we have two salesmen who cover the Chicago territory and the section west of Chicago. While every salesman has his own territory, it is the policy in some sections to have two salesmen, and they alternate in making calls on the trade. They are all paid a certain fixed salary, plus a commission on sales.

CHANGES REPORTED IN DEMAND AND IN DISTRIBUTION METHODS

The opinion of leading mill executives regarding the extent to which changes in the nature of demand and in buying policies in recent years have affected the operations of New England cotton mills are indicated in the statements from a few of the numerous replies to a special inquiry. While the opinion of some executives was that changes in consumer demand had had no appreciable effect on their business, a number of them indicated an outstanding influence on mill operation.

The lack of forward buying in connection with the general change toward hand-to-mouth purchasing was emphasized in one case as working a distinct handicap as far as profits are concerned during the period of the rapidly falling cotton market of the last few years. A mill which formerly received orders on certain lines only twice a year finds that now orders come in every week, and that where it formerly put out sample lines at stated periods, with very little new designing between seasons, it now finds that its designing room, which is claimed to be larger than that of any other firm in its particular lines, is continually buried by demands for new ideas and new patterns.

A manufacturer of fabrics for hospital use reports that in consequence of the great fluctuations of cotton prices hospitals which used to contract for six months or a year now contract for only a 3-month supply at a time. In the sale of cheesecloth this mill regards the hand-to-mouth buying of retailers and wholesalers as a good thing for the trade, because it flattens out production and sales curves, thus making operating and employment conditions more stable. The executive sees a tendency on the part of large consumers to desire more permanent relations with their sources of supply, on the basis of continuing contracts or other means for assuring regular supplies.

The executive of a mill making ginghams states that the rapid changing of fashions and styles has resulted in buying in very small quantities. On account of the time required for manufacture—some three months from designing to finishing—there is a consequent excessive expense for distribution along with the natural diminution of total sales.

The executive of a plant engaged in the manufacture of mechanical fabrics, including fabric and cord for the automobile-tire industry, states that the general adoption of the cord tire and balloon tire a few years ago made obsolete a very large proportion of its equipment, which was designed to make canvas for tires. Quite radical changes and additions to equipment were thus made necessary. This executive states:

> The production of the plant a few years ago was usually sold up for a year or even 18 months ahead; but by reason of the adoption of a hand-to-mouth buying policy we are fortunate now to be sold up two or three months ahead.

A summary of the numerous problems which the changes in consumer demand and other factors have brought to New England cotton manufacturers is offered in the following extended comments of a leading executive:

> There has been a great change in the consumer demand and buying policy in the last five years; changes in styles have been radical and frequent, more so than during previous periods, and buying all along the line has been what is termed on a hand-to-mouth basis. This has been done in order to keep inventories low and to meet the frequent changes in styles. This has made operation of the mills more difficult, as a manufacturing program must naturally be laid out for several months ahead, whereas our customers have not been willing on the whole to buy for several months ahead. This has, therefore. shifted the burden of carrying stock from the buyer to the maker, and to a certain extent put the guessing as to what fabrics would be most salable onto the mills instead of the buyer. Many manufacturers in the face of this situation have therefore curtailed their production rather than stand the hazard of piling up goods.
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> Another very disturbing element during the last five years has been erratic changes in the price of raw cotton, which has influenced buyers in their purchases and introduced serious risks in mill operations.
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> Another factor has been the large increase of imported goods in the finer counts of yarns. This reached its peak two years ago, and has now dwindled off somewhat on account of adverse conditions in England.
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> Another factor has been the quite general practice in the South of running their mills nights. The large increase in production thereby obtained, which is obtained at a labor cost considerably less than in the North, has taken a large amount of business away from the northern mills. This has led a number of northern mills to discontinue making lines made by southern mills. and to go on to new lines which have been heretofore exclusively made in the North, thereby increasing competition of the northern mills among themselves.
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> Another factor has been the large use of rayon, which has been the means of displacing a considerable amount of all cotton cloth, thereby depressing the price of such cloth.
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> An important adverse element which has affected the manufacture of medium and fine cotton cloth, particularly those fabrics entering into women's wear, has been the change of women's styles requiring less yardage of cloth, and also a marked tendency to use silk wherever possible.
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> All these factors combined have created many serious problems for the mills, which some mills have been able to meet successfully, while others have not.

Recognition of the need for special attention by New England manufacturers to the selling end of their business is voiced in the comment of a cotton-yarn manufacturer, whose annual sales amount to $2,250,000.

> The principal trouble in business to-day is selling. The desire of mill managers to keep mills running has led to price cutting, though a large percentage of sales are made at a loss. Price cutting hinders rather than helps sales. Management is largely to blame for the present unsatisfactory balance sheets.

That manufacturers are giving increased attention to the market end of their business and are catering actively to the demand for specialties and novelties is indicated in numerous replies. One of the largest manufacturers of printed and finished cloth and yarn in New England reports the concentration of attention upon a new selling policy. A manufacturer of bed comfortables doing a $3,000,000 business reported the consolidation of selling activities and the opening of a plant in the Middle West. The executive of a mill making ginghams and other piece goods, doing a $5,000,000 business, reports that decreased sales due to changed styles have been offset by catering to the popularity of silk and rayon fabrics. This concern sells its goods under its own trade-mark through a commission agent. Another large company making velvets and corduroys states that better selling and new lines of fabric have taken business from their competitors.

A manufacturer of handkerchief materials, shirtings, and voiles credits increased sales to better sales organization; while a manufacturer of absorbent gauze and cotton bandaging attributes increased sales to more intensive selling and a better product. A mill making coat linings reports also that its own efforts and those of its selling agents have enabled the plant to run continuously. A small manufacturer of cotton and rayon curtain materials reports increased sales in New England resulting from local sales made at the plant, and another mill maintains a retail store for the sale of remnants. Frequent emphasis is placed on the fact that consumer demand has changed the market from one of seasonal activity to one of hand-to-mouth buying. As a consequence, the production of cloth and yarn is spasmodic rather than seasonal. The replies, as a whole, indicate that a closer coordination is taking place between the production phases of cotton manufacture and the marketing of the product.

DYEING AND FINISHING TEXTILES

The processes of dyeing, bleaching, mercerizing, printing, and finishing textiles are carried on mainly in establishments apart from the mills which spin yarn and weave cloth. The unfinished goods are usually sold as they come from the mills to other parties, who have them finished in specialized plants that have equipment for performing the particular processing required for the final market. This work is done principally under contract at a certain price per yard or per pound, for converters who purchase the goods in the gray from the mills. Some of the larger mills have their own dyeing and finishing establishments, and some others have all or a portion of their mill output finished for their account in outside plants.

Dyeing and finishing plants thus do not usually buy and sell the goods which they prepare, but are rather sellers of their services. Their logical location is near the mills, which provide the market for these services. Nearness to the textile mills and to the market for the finished products has been the dominant reason for the establishment and continuance of dyeing and finishing plants in New England. An abundant supply of clear water for the processes of dyeing and bleaching has also favored their growth in this section. The clear streams of New England are a distinct and permanent asset in this respect.

The processes require elaborate and highly specialized equipment for particular kinds of finishing. Most of the work done by separate dyeing and finishing plants is in connection with cotton manufacture. In wool manufacture the prevailing practice has been to finish the goods at the plants where they are woven.

IMPORTANCE OF THIS PHASE OF MANUFACTURE

This branch of the textile industry in New England engaged the activities in 1925 of nearly 30,000 persons, including more than 26,000 wage earners. It distributed in salaries and wages nearly $39,000,000 and was a source of manufacturing revenue to the region of approximately $62,700,000.

Of the 147 establishments reported by the census in 1925, all but 3 were located in Massachusetts, Rhode Island, and Connecticut. In these three States were 37 per cent of the persons engaged nationally in this activity. The number of establishments is approximately equal in Massachusetts and in Rhode Island, although the industry has greater importance in the former State. In Connecticut it is of much less consequence than in the other two States.

Census figures for 1927 show an increase since 1925 of six establishments, with a slight reduction in wage earners but actual increase in total wage payments. Despite a substantial falling off in the gross value of the product and in the outlay for materials, there was an actual increase in the reported net revenue, as indicated in value added by manufacture. Figures for the individual States for the two census years are shown in the following table.

Dyeing and Finishing of Textiles in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	68	13,826	16,229	51,434	84,460	33,025
1925	65	13,872	16,099	87,586	119,110	31,524
Rhode Island:						
1927	62	9,590	11,521	19,566	44,979	25,414
1925	63	9,860	11,471	21,961	47,164	25,202
Connecticut:						
1927	20	2,551	3,256	4,812	11,779	6,967
1925	16	2,408	2,935	3,902	9,875	5,973
Total:						
1927	150	25,967	31,006	75,812	141,218	65,406
1925 [1]	144	26,140	30,505	113,449	176,149	62,699

[1] Not including Maine, 1 establishment; New Hampshire, 2 establishments.

Because of incomplete statistics for this branch of the textile industry, arising from lack of a uniform basis for reporting the value of product and the cost of materials in individual plants, the data from the census can not be construed as strictly comparable with figures for other textile lines. They are presented here as reported, however, in order to give an approximate idea of the status of the industry in the various States. These include not only the dyeing and finishing plants for the cotton industry but for wool, silk, and other textiles as well, since the census makes no distinction in types of fabric in this industry.

Outside New England the three States of New Jersey, Pennsylvania, and New York had about one-half the total number of persons engaged in this line for the whole United States. Each of these States had a greater number of establishments than did all New England, but in no one of them individually were there as many persons engaged. New Jersey had approximately 27 per cent of the national total of persons engaged in the industry, and New York and Pennsylvania together had 22 per cent.

The activity in New England and these three other important States represents over 85 per cent of the United States total. It is relatively unimportant in other States. North Carolina, with 10 establishments, and South Carolina, with 8 establishments, are the only other States in which more than 1,000 persons were engaged in 1925. Several large plants have been established in these Southern States since that time.

The industry in New England has followed the general trend of textiles, for the fortunes of dyeing and finishing plants fluctuate with mill activity. The maximum year in number of persons engaged and in salaries and wages paid was 1925. The greatest number of establishments and the highest net income, however, was reported in 1923. There was a loss of 10 establishments in the 2-year interval, but a very slight increase in the number of persons engaged. From 1914 to 1919 there was an increase of 29 establishments and an increase of 3,200 in number of persons engaged.

From 1914 to 1925 the number of wage earners in this line increased 24 per cent in New England, in comparison with a national increase of 46 per cent. From 1923 to 1925 the number of wage earners in New England increased by less than 1 per cent, while for the United States as a whole the increase amounted to 11.6 per cent.

EXPERIENCES OF NEW ENGLAND PLANTS

The following summary of statements received from executives representing a portion of this industry in New England is presented to show the recent experiences of concerns engaged in dyeing and finishing textiles:

Type of operation.—Of 33 firms giving information regarding plant operations, the greater part were engaged in dyeing, bleaching, and finishing cotton cloth, but 9 of them devoted their activities exclusively to yarns. Most of these establishments have been engaged in this kind of activity since their start.

Age of business.—Eight of the reporting firms had been established within the last 15 years, and 9 of them between 15 and 50 years. There were 8 plants that had been in operation over 50 years, and 4 others were more than 100 years old. Fifteen of the establishments had been under the present management less than 15 years, 6 of them from 15 to 25 years, and 8 of them over 25 years.

Branches.—Only four companies reported any branches; one of these has a branch in the Middle West and another branch in the South, established in 1911 and 1922, respectively; another concern reports a branch in Philadelphia, established in 1912; one company has a branch in Rhode Island, while another is a branch of a New Jersey company.

Plant activity.—Twenty-six companies which gave figures regarding their 1925 activity reported an aggregate income of approximately $18,750,000 and had an average employment of 5,094 workers. Fifteen of these firms had an annual income in 1925 of less than $500,000 each, and 11 of them had over $500,000; of the former, the income of 8 was under $100,000 each and that of 7 others was between $100,000 and $500,000; of the larger companies, 7 did a business between $500,000 and $1,000,000, and 4 were over a million; 3 of these exceeded $2,000,000, and 1 of them approached $4,000,000. The 10 largest companies account for over 80 per cent of the total income for the 26, and more than 90 per cent of the total employment; 12 firms employed fewer than 50 workers each, 11 of them between 50 and 250 workers, and 6 between 250 and 1,000 workers.

Changes in the aggregate income of 23 concerns giving continuous figures from 1923 to 1925 are shown by the following totals: For 1923, $17,844,000; for 1924, $15,251,000; for 1925, $18,749,000. Practically all these companies showed an increase in income from 1921 to 1923; 16 showed a decrease from 1923 to 1924, and 7 showed an increase from 1924 to 1925. Twelve establishments reported that they were operating in 1925 at from 75 per cent to 100 per cent of their maximum capacity; 9 firms from 50 per cent to 75 per cent; and 2 concerns at less than 50 per cent of the maximum. Seven establishments reported increases in the capacity of their plants since 1921, 4 of these being 25 per cent each, 2 others 50 per cent each, and 1 increased 100 per cent.

Materials used.—The principal materials reported by these manufacturers are chemicals for bleaching and dyeing, starches and other finishing material, soaps, oils, chlorine gas and lime, besides boxes, paper, and lumber for cases.

Distribution of output.—The replies indicate that all these concerns operated for textile manufacturers or converters on a contract basis, by the yard, pound, or piece, often shipping the finished product to the converters' customers. Three of the establishments sell yarn in addition to their commission finishing, and each of these reported the use of trade-marks on their product. Fifteen of the companies reported the use of trade journals with a national circulation as advertising mediums.

Sources of business.—Regarding the principal source of their business, 12 firms reported that from 75 per cent to 100 per cent comes from clients within New England. Six others, including one of the largest, stated that only from 10 to 20 per cent of their activity was contributed by mills within New England. One concern stated that all of its business originated within a 100-mile radius, and another confined its whole activity to six converters in New York City. One manufacturer explained that the tendency to concentrate the converting of cotton and silk goods in the New York market was responsible for the decreased activity of New England plants.

Improvements effected.—Comments by individual manufacturers regarding improvements effected in facing the problems of the industry include in one case the introduction of a special bonus system for paying the entire force, and in another instance monthly meetings of foremen for joint consideration of ways to maintain and increase plant efficiency. One manufacturer speaks of the necessity of very close inspection of goods on account of market declines. A change from the bleaching and dyeing of cotton piece goods to fast-color dyeing and finishing of rayon fabrics is indicated by one executive, and another states that increases in rayons have made up for the decrease in cottons. Other concerns report improvements in working conditions, standardization of products and practices, production control through development of purchasing schedules, and maintenance of high quality of output through close inspection of products.

COTTON MANUFACTURES OTHER THAN OF WOVEN GOODS

The New England production of other cotton fabrics in addition to woven cotton cloth, comprising yarns for sale, thread, waste, small wares, and cotton lace, is of substantial importance. The aggregate value of its output in 1925 exceeded $180,000,000, and represented over one-fourth of the total value of all New England cotton manufactures. The general location of establishments in these groups runs parallel to the location of other cotton manufactures, with the greater portion of activity confined to the three southern States of New England.

Statistics for yarn, thread, and cotton waste are included with woven goods in the census totals for cotton goods as a whole; hence these individual items can not be segregated by States. Figures for cotton small wares and cotton lace, however, which are compiled separately, are available for the individual States.

Production and value of yarns for sale, cotton sewing thread, and waste, in New England as a whole, and their relation to the total for the United States, are shown for the census years from 1909 to 1925, inclusive, in the next table.

In each of these three lines it is observed that the value of the New England production represents a higher proportion of the national production than does the quantity produced, thus indicating the relatively higher unit value of the New England output.

New England Production and Value of Cotton Yarns for Sale, and of Cotton Sewing Thread and Cotton Waste for Sale 1909–1925

Year	Thousands of pounds		New England as per cent of United States	Value in thousands of dollars		New England as per cent of United States
	New England	United States outside New England		New England	United States outside New England	
Yarns for sale:						
1925	109, 123	517, 234	17. 4	68, 178	244, 882	21. 8
1923	113, 310	507, 416	18. 3	79, 800	268, 884	22. 9
1921	104, 393	379, 825	21. 6	77, 742	140, 813	35. 6
1919	209, 132	409, 070	33. 8	191, 997	261, 768	42. 3
1914	143, 329	354, 658	28. 8	50, 075	77, 289	39. 3
1909	141, 788	328, 583	30. 1	42, 723	66, 592	39. 1
Cotton sewing thread:						
1925	23, 312	14, 273	62. 0	43, 912	15, 964	73. 3
1923	21, 164	10, 481	66. 9	41, 127	14, 184	74. 4
1921	15, 989	7, 286	68. 7	35, 000	15, 202	70. 0
1919	12, 163	14, 279	46. 0	25, 231	29, 778	45. 9
1914	10, 389	16, 118	39. 2	8, 558	14, 359	37. 3
1909	10, 279	13, 422	43. 7	8, 802	11, 714	42. 9
Cotton waste for sale:						
1925	172, 548	244, 547	41. 4	19, 137	21, 480	47. 1
1923	172, 783	205, 857	45. 6	18, 513	18, 793	49. 6
1921	144, 113	127, 663	53. 0	7, 996	5, 311	60. 1
1919	180, 639	134, 675	57. 3	24, 166	12, 192	66. 5
1914	184, 979	132, 381	58. 3	9, 629	4, 793	66. 1
1909	189, 496	121, 017	61. 0	7, 619	3, 256	70. 8

COTTON YARN FOR SALE

Cotton yarns produced in New England for sale had a value in 1925 exceeding $68,000,000, representing 10.3 per cent of all cotton manufactures of the region. New England contributed only 22 per cent of the total national value, however, in contrast with 36 per cent in cotton manufactures as a whole. The State of Massachusetts is naturally the chief producer, with a produce in 1925 valued at $45,000,000. The output in Rhode Island had a value of about $9,600,000 and that of Connecticut approached $6,000,000. In 1925 the State of North Carolina produced more than twice as much yarn for sale as all New England.

Most of the yarn made by New England cotton mills is woven into cloth at the mill. Some mills, however, sell their whole output as yarn and quite a number of others whose primary product is cloth sell a portion as yarns.

There are several outlets for yarns sold by New England mills. Some of it is sold to other mills for making woven mixtures with wool or silk, but much of it is used in the manufacture of sewing thread and of various cotton small wares, also in making cotton knit goods.

Cotton yarn has followed the general trend of cotton-goods manufacturing in New England. Its position in the national output was well maintained from 1909 to 1919, and it showed a substantial increase in relation to the rest of the country during the war period. The year of maximum production, as well as maximum value, was 1919. In the next two years both volume and value fell off to less than half the 1919 figures. These both showed a substantial increase in 1923, with a pronounced falling off in 1925.

Size and age of establishments.—Replies to inquiries by the Department of Commerce were received from 19 manufacturers of cotton yarns, embracing a total volume of sales exceeding $21,000,000 and giving employment to approximately 5,300 persons. Eleven of these concerns made and sold nothing but yarn, while 8 of them made additional products. Their individual sales volume in 1925 ranged from $100,000 to $3,000,000 each. There were 8 with sales between $1,000,000 and $3,000,000; 7 others between $500,000 and $1,000,000; and 3 between $100,000 and $500,000. Four of the firms reported between 500 and 1,000 employees, 13 between 100 and 500, and 2 fewer than 100 employees.

Only 2 of the companies had been in business less than 15 years; but 7 had had new management within that period, while 8 had been under the same management from 25 to 50 years and 1 over 50 years. Branch plants were reported by 3 of the companies—1 located in Pennsylvania and 2 in New England—established in 1919, 1924, and 1925, respectively. Nine of the establishments were operated at 75 per cent or more of maximum capacity in 1925, and 3 of these reported full operation. Six were operating from one-half to three-quarters of the maximum and 4 below one-half capacity. Additions to capacity of plant since 1921 were reported in two instances.

Changes in sales.—Fourteen of the replies indicated significant increases in sales from 1924 to 1925, and five indicated decreases. While decreased sales were experienced from 1923 to 1924 by all but 2 of the 19 firms, substantial increases were shown by 7 companies from 1923 to 1925, 10 showed decreases, and 2 remained unchanged. Several companies made very substantial increases in 1925. The total sales of five large manufacturers, each with a 1925 volume between $1,000,000 and $3,000,000, increased from $7,460,000 in 1923 to $9,145,000 in 1925.

Increased sales are credited by individual manufacturers to maintenance of a high standard of quality, to the opening up of new sales territory, and to making the right material at right prices to the consumer. One manufacturer reported an increase in New England sales as due to low prices and better salesmanship. The head of a concern doing a $500,000 business, which had changed its product from tire-fabric yarns to cotton yarns for sale, spoke of southern competition and of mill capacity in excess of requirements, saying: "Our present aim is to produce a quality that will be sought." In another instance a large manufacturer reports the starting of a weaving plant to take care of the surplus product of his cotton spindles. A manufacturer of fine cotton yarn, doing a $2,000,000 business says: "Our organization as a whole is constantly improving." A number of the replies spoke of the keen competition from outside New England, while a few reported competition from both New England and the South.

The product of these mills was sold prevailingly in New England or the Middle Atlantic States. Ten of the manufacturers reported that from three-quarters to all of their sales were made in New England, while 3 indicated that from one-half to three-quarters of their market was in that section, and 4 stated less than half. Sales in New England were said, in 10 of the replies, to be decreasing, while 5 stated they were increasing and 3 indicated no change. Six concerns reported sales in the Middle West and one in the Western States. Only four firms indicated direct exports, and these were very slight amounts.

Channels of distribution.—Ten of the 19 companies reported sales made direct to manufacturers, while 7 made sales through selling agents and 2 sold direct to wholesalers. One yarn manufacturer reached his New England trade by his own salesman, but covered New York and Pennsylvania through a selling agent. Twelve of the firms indicated that they use a single channel, while 7 employ more than one.

Trade-marks and advertising.—Practice regarding the use of trade-marks on their yarns was evenly divided between concerns whose product bore an identifying brand or name and those with no trade-mark. In the use of advertising, also, there was no uniformity, 7 concerns reporting the use of trade journals or direct mail and 5 indicating no advertising of any kind.

COTTON SEWING THREAD

The sewing-thread industry of the country is largely concentrated in New England, in the States of Massachusetts and Rhode Island. New England produced about five-eighths of the national output of cotton sewing thread in 1925, comprising three-fourths of the national value.

Growth of industry.—The industry has shown a continuously steady and healthy growth in New England. The New England production advanced from 43 per cent of the national total in 1909 and a value of less than $9,000,000 to 70 per cent in 1921 and to over 73 per cent in 1925, when its value was nearly $44,000,000. The manufacture of sewing thread in New England has had a steady and healthy growth, with no setbacks either in volume produced or in value of output. The 1925 production of 23,312,000 pounds was an increase of more than 2,000,000 pounds over 1923 and of more than 7,000,000 pounds over 1921. The national production increased by 61 per cent in quantity from 1921 to 1925, while that of New England increased only 46 per cent. In value, however, the national increase was only 19 per cent, while in New England the increase was more than 25 per cent.

Massachusetts, the only State for which separate figures are available, produced 13,210,000 pounds of cotton sewing thread in 1925, with a value of $22,467,000, contributing slightly more than half the New England total in that year.

Source of materials.—Cotton yarn is the chief material used by thread manufacturers, and the source is about equally divided between New England and other sections. Replies from 11 concerns making sewing thread for sale to shoe and garment manufacturers or as spool cotton indicated that all of them purchased cotton yarn from other concerns rather than spinning it themselves. Each of these concerns was engaged solely in making thread. The total sales of these companies in 1925 were $8,754,000, and they employed 1,150 workers. Nine of the 11 plants had been established within the last 25 years and 6 of these within 12 years.

Distribution of products.—The majority of replies reported distribution direct to the manufacturing consumer, although a few market their output through selling agents or wholesalers, and one company maintains its own sales offices and retail stores in New York and Middle Western States.

Trade-marks and advertising.—The practice of using trade-marks appears general, all but 2 of these concerns stating that all of their output was branded, and the other 2 trade-marked a portion. National advertising was indicated in four instances, the trade journal being the main channel.

Location of markets.—This product shows wide distribution. Seven concerns stated that their principal sales are made in New England and the Middle Atlantic States, while 3 others market their product chiefly in the Middle West and 2 concerns reported nation-wide distribution. Nine of these companies stated that sales within New England comprised 20 per cent or less of their total business, and only two replies indicated New England as the principal market. Direct exports of any consequence were reported in only one instance, where they amounted to 6 per cent of the company's total business; three other plants stated that their exports were less than 1 per cent. Sources of competition were stated by these concerns to be confined to New England and the Middle Atlantic States.

COTTON WASTE

The value of the cotton waste produced in New England for sale in 1925 was more than $19,000,000. Massachusetts, which was the leading State of the country in the production of cotton waste for sale, contributed nearly $11,000,000 of this total and Rhode Island nearly $5,000,000; minor amounts came from Connecticut, Maine, and New Hampshire.

Cotton waste is used principally for wiping machinery, for packing car-wheel journals and heavy machines, and for making mop yarns and various other coarse textile products. The proximity of a market for this by-product of the cotton-goods industry provides a commercial outlet of substantial importance. The volume of New England production of cotton waste for sale has been fairly regular in recent years, except for a sharp drop in 1921. Its value, however, has fluctuated widely in the different census years and has borne little relationship to the quantity produced. The value of the New England output showed a moderate increase in 1925 compared with 1923, but the New England proportion of the national value has declined, in consequence of great increases in the output of other sections of the country.

Replies from a number of concerns engaged in the processing of cotton and wool waste for sale indicated that the New England market absorbed upward of half of their output. About 70 per cent of the product of these reporting companies was branded. Distribution was generally made direct to the industrial consumers, but in some cases it was made through wholesale and retail dealers, or through selling agents.

COTTON SMALL WARES

The cotton small-wares industry is a specialized branch of textile manufacture which includes a considerable variety of narrow woven or braided fabrics, such as webbing, elastic and nonelastic tapes and cords, also mill banding, buffing wheels, fabric belts and belting, garment trimmings, edgings, figure labels, as well as flat and round braids, shoe laces, and corset laces. Most of these products are made in separate establishments, but a small portion of the total is included with other cotton goods. The industry contains a relatively large number of medium-sized or small plants in comparison with the other cotton manufactures of New England. Although the value of these products made in separate establishments comprised only 7 per cent of all New England cotton manufactures in 1925, yet the national importance of this industry is indicated in the fact that New England contributes more than 60 per cent of the total United States output of cotton small wares. Outside of New England the important States are Pennsylvania, New York, Georgia, and New Jersey, in the order given.

The product of 140 New England establishments in this industry was valued, in 1925, at nearly $45,000,000, engaging the activities of more than 11,000 persons, who were paid more than $12,000,000 in wages and salaries. The industry added more than $20,000,000 to the New England manufacturing income. It provided a market for materials amounting to nearly $25,000,000, including fuel, power, and mill supplies, in addition to textile materials. Southern New

England is the seat of this industry, Rhode Island leading in 1925 with 66 establishments, which contributed nearly 40 per cent of the New England total. Connecticut surpassed Massachusetts in output, although the latter State had more than three times as many establishments engaged in this line. Its importance in the various States is shown in the following table.

IMPORTANCE OF COTTON SMALL-WARES[1] INDUSTRY IN NEW ENGLAND IN 1925

States	Establishments	Persons engaged	Thousands of dollars			
			Wages and salaries	Cost of materials	Value of products	Value added by manufacture
Rhode Island	66	4, 704	5, 221	10, 117	17, 845	7, 728
Connecticut	16	3, 085	3, 610	7, 144	13, 641	6, 728
Massachusetts	52	2, 943	3, 101	6, 952	12, 375	5, 423
New Hampshire	6	288	316	502	1, 040	539
New England	140	11, 020	12, 248	24, 715	44, 901	20, 418
United States	230	17, 778	19, 801	41, 816	74, 675	32, 859

[1] Small wares reported as secondary products by establishments engaged primarily in other industries for the whole United States in 1925 amounted to $5,600,000.

Materials and products.—The principal textile materials used in this industry are cotton yarns and domestic short-staple raw cotton, with some silk and rayon and rubber thread. This industry in 1925 in the whole country consumed 21,339,000 pounds of raw cotton and 42,734,000 pounds of purchased yarn. It thus appears that about two-thirds of the industry buys yarns manufactured by other establishments, while one-third spins its own yarn from the raw cotton. A portion of the purchased yarn comes from New England mills, but a considerable part of it comes from outside New England.

The most important single product is woven elastic webbing, whose value in Rhode Island, Connecticut, and Massachusetts in 1925 exceeded $20,000,000. Its volume in that year was 14,034,000 pounds, showing a substantial increase in weight from 1923 but a reduction in linear yardage as well as a reduction in total value. For the country as a whole the value of all cotton small wares showed an increase of 2 per cent in this period in the value of the product but a falling off of 5 per cent in the value added by manufacture.

Production and sales practices.—Replies to special inquiries regarding production and sales practices were received from 57 New England manufacturers of cotton small wares with aggregate sales of $27,887,000 and a total employment of 5,125 workers. They represented 57 per cent of the New England total for this industry in that year. Thirty of these concerns were engaged primarily in making elastic or nonelastic webs, braids, or tapes, while 19 other plants were makers of shoe laces and other lacings as their sole or main product. Secondary lines reported by individual companies include the making of specialties for radio and other electrical equipment, sleevings, lamp wicks, cotton neckwear, trimmings, and notions. Two concerns reported also job dyeing and converting of yarn as supplementary activities, and one firm manufactures broad silk cloth as a side line.

Size and age of establishments.—The small-scale operation in this industry is indicated by the fact that the majority of these establishments employed fewer than 50 workers each. Twelve firms reported from 25 to 50 persons, and 12 others employed from 50 to 100 workers each. Of the larger companies, 6 firms had a pay roll of upward of 100 workers each, and 4 of these exceeded 200 workers each; 2 of these companies had over 500 employees, and 1 of them over 1,000. The four largest establishments employed nearly three-fifths of the total workers reported. Sales in 1925 of less than $100,000 each were reported by 23 manufacturers, and in 14 of these they were under $50,000. Sales in excess of $100,000 were reported by 34 concerns, 8 of these exceeding $500,000 each, and 6 of them over $1,000,000 each. Sales of the 6 largest firms made up two-thirds of the total for the 57 companies.

The replies indicated that this industry is of much more recent development in New England than the cotton-goods industry in general, and that considerable readjustment has been taking place recently. The majority of the plants reporting were established within the last 25 years. Thirty-two had come into existence within 15 years and 21 of these within 10 years. In 17 plants a change in management had taken place within 10 years. Of the manufacturers of shoe laces, the oldest one reporting under present management goes back only 21 years. Only five of the other cotton small-ware manufacturers had been under their present management longer than 25 years, the oldest one being 41 years.

Branch plants were reported by 9 of the companies; 6 of these are in New England, 1 in Tennessee, 1 in Michigan, 1 in California, and 1 in Canada.

Changes from original products.—Most of the companies indicated no changes from the original use of their plants. Two firms had discontinued shoe laces; another had changed from shoe manufacturing to shoe laces; one had changed from making shoe goods to nonelastic webbing; one made a different type of webbing; and another had added new automotive lines. One manufacturer discontinued the spinning of yarn because he found it cheaper to buy yarn from the South.

Sales volume and plant activity.—The aggregate volume of sales of 41 concerns making small wares other than shoe laces in 1923 was $23,700,000; in 1924 it was $19,875,000, and in 1925 it was $22,700,000, thus showing a reduction in their total of approximately $1,000,000 from 1923 to 1925. Over this 2-year period the net change for 38 of these concerns which gave continuous sales figures included 22 companies whose sales increased, 14 which decreased, and 2 which remained unchanged. Of the total number of 57 reporting concerns which indicated the ratio of their production in 1925 to the maximum capacity in that year, there were 29 which reported operations from 75 per cent to 100 per cent, and 6 of these were operating their plants at the maximum; there were 22 others operating at 50 per cent to 75 per cent and 6 others below 50 per cent of their maximum producing ability. The ratio of output to maximum capacity in 1925 showed an average of 68 per cent for all plants reporting.

Markets.—It appears that the majority of the cotton small wares find a market outside New England. Fifteen companies stated that their principal market was in the Middle Atlantic States and 2 reported national distribution. Out of 43 firms indicating the proportion of sales made in New England, 35 of them stated that less than one-half of their sales were in this section, and only 8 reported the majority of their sales there. Twenty-two firms indicated the presence of keen competition from within the New England States, while only 12 mentioned competition elsewhere—3 of these stating the Middle Atlantic States and 3 of them the South.

COTTON LACE AND LACE PRODUCTS

Machine-made cotton-lace goods and articles in which cotton lace is largely used comprise one of the minor textile industries of New England. The cotton-lace industry in these States is estimated to engage the activities in 1925 of some 2,000 persons, paying about $1,750,000 in wages and salaries and adding about $3,500,000 to the New England income from manufacturing. It provided a market for various materials, including fuel and supplies, estimated at $2,684,000. Nearly all the mills in this industry purchase their yarns. Imported yarns are used chiefly in making Nottingham and Levers lace, and in bobbinet machines.

Cotton lace.—There were 15 lace-making establishments in New England reported in the 1925 census. Separate figures were given for only nine establishments in Rhode Island, whose product had a value of nearly $3,000,000. By apportioning the figures for the 6 establishments in Connecticut and 1 in Massachusetts from the undistributed United States total, the importance of the industry for New England as a whole appears as shown in the following table. In this activity New England is greatly overshadowed by Pennsylvania, which contributed more than 60 per cent of the national value. New York State also surpassed Rhode Island. Rhode Island produced approximately one-half of the national output of Levers laces, its product amounting to 4,481,000 square yards, valued at $2,963,000.

COTTON LACE GOODS IN NEW ENGLAND, 1925 AND 1927

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of product	Value added by manufacture
Rhode Island:						
1927	10	846	$927, 298	$1, 143, 037	$2, 792, 670	$1, 649, 633
1925	9	733	825, 000	1, 243, 000	2, 973, 000	1, 730, 000
Connecticut: [1] 1927	6	459	533, 832	505, 978	1, 474, 993	969, 015

[1] There were 6 establishments in Connecticut in 1925.

Replies to special inquires were received from eight New England establishments making lace, representing a total employment of 384 workers and sales in 1925 of $1,750,000. Three of these concerns were located in Rhode Island, 3 in Connecticut, and 1 each in Massachusetts and New Hampshire. All these concerns were of comparatively recent origin, the oldest one being only 15 years under its present management. Several made supplementary products in addition to lace, the principal ones being curtains, bedspreads, woven trimmings, edgings, fancy braids, and the finishing of silk piece goods. Five of these concerns had individual sales of less than $100,000, and three of them did a volume of business between $200,000 and $400,000 each. Only two companies gave employment to more than 50 persons each.

The aggregate sales volume of these eight concerns was $1,809,000 in 1923, $1,472,000 in 1924, and $1,750,000 in 1925. Five of the companies reported operations in 1925 at less than one-half their maximum capacity and three had from 50 to 85 per cent of maximum. The largest firm reporting, and the only large company whose sales showed a continuous growth, increased its business by the addition of silk finishing to its main line of lace making.

Reasons generally given for decreased sales were the lessened demand for laces for wearing apparel and household fabrics and the competition from the low-cost imported goods. One manufacturer says, " Women wear much less lace, and it can be imported cheaper than we can make it."

Several reported that they made no sales in New England, and all but one indicated that New England sales represent only a small portion of their business. The principal sales channels are through wholesalers and the cutting-up trade to dress and hat manufacturers and to embroiderers. Sales are made largely through New York City. One small firm expressed the intention of selling by mail direct to consumers. As regards improvements, one of the three large concerns reported a consolidation of selling activities, while another had introduced new sales methods and new products, and a third small establishment spoke of emphasis upon better quality and a lessened cost of production.

Curtains and draperies.—The manufacture of goods in which lace is an important material shows some interesting contrasts with the making of lace itself. Replies from concerns making lace curtains, scrim, marquisette, and novelty curtains, overdrapes, and curtain piece goods showed aggregate sales of 12 reporting companies amounting to $4,219,000 in 1923, $5,111,000 in 1924, and $6,886,000 in 1925. Ten of these companies were located in eastern Massachusetts and one each in Connecticut and Rhode Island. Five of them had been in business 10 years or less, 5 others between 10 and 20 years, and 2 more than 25 years. With one exception all had been under the same management since their start. Two of the establishments reported individual sales of less than $100,000 and 6 as between $100,000 and $500,000, while 2 large concerns had sales between $500,000 and $1,000,000, and 1 more than $3,000,000.

The average employment of 5 of these concerns was fewer than 50 persons, of 5 others between 50 and 100 persons, while the largest company had 650 workers on its pay roll. Two of the concerns reported making piece goods and sheeting in addition to curtains. Of 10 replies regarding the ratio of 1925 output to maximum capacity, 5 concerns were running at full capacity, 4 at 75 per cent to 80 per cent, and 1 at 60 per cent. Eight of the concerns had a continuous net increase of sales from 1923 to 1925, and there were 10 whose sales showed an increase since 1924. In comparison with the cotton-lace industry, therefore, these manufacturers of curtains and other lace products showed decided prosperity.

Five companies indicated that the greater part of their product was sold in New England, while 9 indicated that not more than one-third of their sales were in those States. Five companies had their principal market in the Middle Atlantic States and 4 reported national distribution; others mentioned market outlets in the Middle West, the Southern States, and the far Western States. Three manufacturers stated that their New England sales were on the increase, and one of these indicated a marked growth of business in that section. A maker of ruffled curtains stated that he thought the Middle West a better selling market. Decreased sales in New England were reported as due to a change in selling policy, while another manufacturer stated that the demand for low-cost goods had decreased his New England sales.

The majority of the manufacturers in this line sell their products direct to retailers; 10 replies indicated this channel, while 2 reported sales to wholesalers. Several manufacturers stated that their entire output was branded, while two made no use of trade-marks. The employment of advertising was reported by six companies, mainly in the form of trade journals or direct mail, with the use of local newspapers in one instance. Increased sales by the manufacturer of novelty curtains selling throughout New England and the United States were attributed to "hard work by salesmen, volume buying, and close selling." One of the concerns, operating at full capacity and doing a national business, with its principal market in the Middle West, credited its continued increase of business to "continued 'pep'," while another manufacturer frankly blamed the small volume of his New England sales upon his own lack of effort to cultivate the market.

The treasurer of a large and growing concern making marquisette curtains, scrims, and sheetings, whose business more than doubled since 1923, reports as follows regarding the marketing practice of his company:

> Our organization is a growing concern with a new idea. We have our own selling organization, which sells direct to jobbers and to the large retailers who do not buy through jobbers. Our salesmen are mostly paid a salary, although some have a commission which covers all their expenses. We distribute the salesmen over the different territories, 1 taking the Pacific coast, 3 dividing up the Western States, 1 in the Southern States, 3 in New York and the Central States and Canada, and 2 in Massachusetts. Besides these, two officers of the corporation are salesmen, who operate generally without specific territories.

Another medium-sized concern manufacturing curtain materials maintains a salesroom and display department in New York City.

From the replies of manufacturers of curtains and curtain goods, this industry appears to show pronounced prosperity. It affords an example of success attained by catering to the popular demand for a new type of manufactured product, which can be marketed by direct merchandising methods.

WOOL MANUFACTURES

RELATIVE IMPORTANCE OF INDUSTRY

Although the wool manufactures of New England are surpassed in volume by cotton manufactures, the former are of much greater national significance. New England contains approximately one-half of all the wool-manufacturing establishments of the United States and contributed 54 per cent of the value of the national output in 1925. In the manufacture of woolen and worsted goods, which are its principal wool products, New England contributed 64 per cent of the total value and 65 per cent of the national income from this branch of manufacture. The wool manufactures contributed 11 per cent of the total value of all manufactured products of this region in 1925 and represented about 8.5 per cent of the total New England income derived from all manufacturing activity.

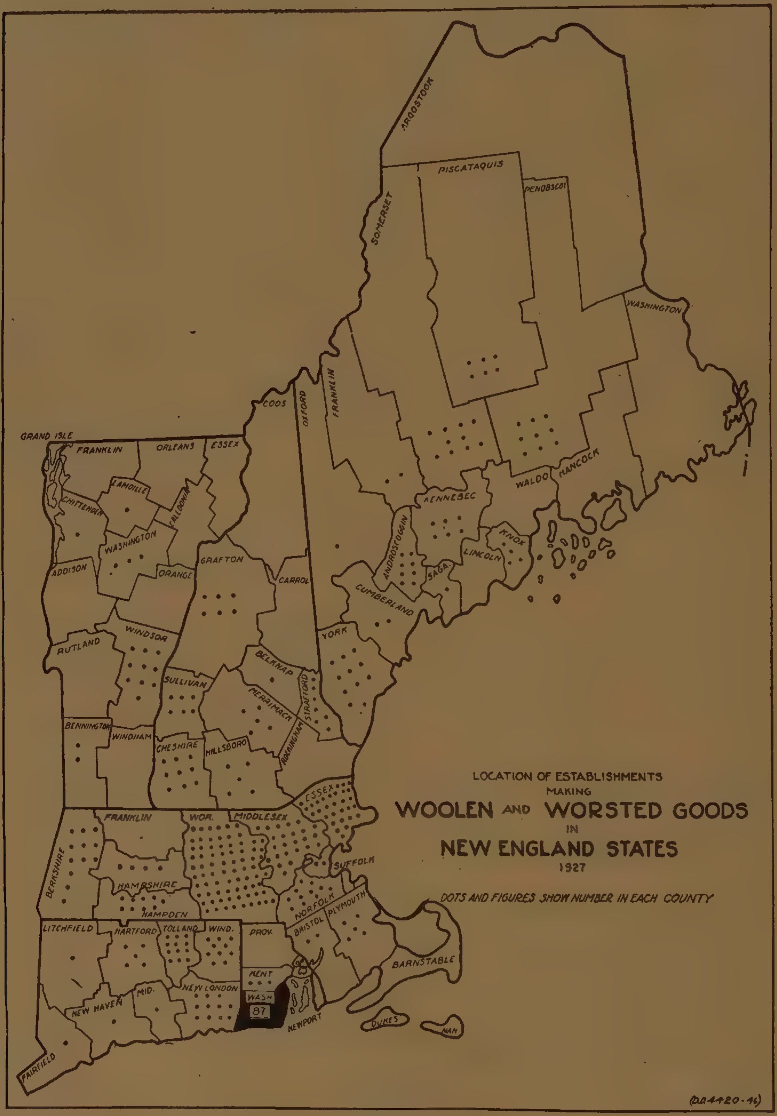
The 538 New England wool establishments added to the revenue of the region not far from $250,000,000, and their product had a value exceeding $660,000,000. Of this income more than $153,000,000 was distributed in wages and salaries to some 120,000 persons who were engaged in its various activities. The importance of the various lines of wool manufacture in 1925 and 1927 is indicated by the following table.

WOOL MANUFACTURE IN NEW ENGLAND, 1925 AND 1927

Commodity and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Woolen and worsted:						
1927	418	102, 458	117, 565	333. 041	543, 304	210, 264
1925 [1]	443	106, 155	142, 996	394, 663	614, 936	220, 274
Carpets and rugs:						
1927	10	4, 473	5, 613	10, 638	22, 680	12, 043
1925 [2]	9	4, 427	5, 668	12, 027	23, 883	11, 836
Felt goods:						
1927	17	1, 249	1, 559	6, 679	10, 653	3, 974
1925 [3]	18	1, 229	2, 004	7, 470	11, 938	4, 469
Reworked wool:						
1927	26	667	815	2, 585	4, 298	1, 712
1925 [4]	36	662	1, 161	3, 474	5, 216	1, 743
Wool scouring:						
1927	12	568	859	688	1, 094	405
1925 [5]	12	544	973	880	2, 398	1, 518
Total:						
1927	483	109, 415	126, 410	353, 632	582, 029	228, 397
1925 [6]	518	113, 017	152, 802	418, 514	658, 371	239, 860
Total United States, 1925	1, 044	207, 586	283, 335	768, 391	1, 217, 322	448, 879
New England as per cent of United States in 1925	49. 6	54. 4	53. 9	54. 5	54. 1	53. 4

[1] Excluding 4 worsted establishments in New Hampshire and 1 in Vermont.
[2] Massachusetts only, excluding 1 establishment in Connecticut.
[3] Excluding 2 establishments in Maine, 2 in New Hampshire, and 2 in Rhode Island.
[4] Excluding 2 establishments in Maine and 2 in Vermont.
[5] Excluding 1 establishment in Connecticut and 1 in Rhode Island.
[6] Exclusive of 20 establishments.

The principal item, woolen and worsted goods, represents over 90 per cent of all New England wool manufactures, with a product approximating $615,000,000 in gross value in 1925 and a contribution of more than $220,000,000 to the income of the region. In this branch there were 448 establishments, which engaged the activities of more than 111,600 persons. There were also 40 concerns for reworking wool and 14 establishments engaged in wool scouring.



LOCATION OF ESTABLISHMENTS MAKING **WOOLEN AND WORSTED GOODS** IN **NEW ENGLAND STATES** 1927

DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY

AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
ANDROSCOGGIN
KNOX
LINCOLN
SAGA.
CUMBERLAND
YORK
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
SULLIVAN
BELKNAP
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR.
MIDDLESEX
BERKSHIRE
HAMPSHIRE
HAMPDEN
SUFFOLK
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH
87
MID.
NEW LONDON
NEW HAVEN
FAIRFIELD
NEWPORT
DUKES
NAN
(DA4420-46)

Figure 40

Besides these there were 26 concerns making felt goods and felt hats from wool and hair, with a product exceeding $12,000,000 in value. The manufacture of wool carpets and rugs was represented by 10 concerns, with a product estimated at more than $25,000,000 in value.

MATERIALS USED

The wool industries of New England in 1925 provided a market for materials, including fuel, power, and supplies, in addition to the fibers directly used in manufacture, amounting to about $420,000,000.

New England wool industries absorb more than one-half of the total raw wool consumed within the United States. The proportion in 1925 was 51 per cent; in 1919, 54 per cent; and in 1914, 52 per cent. Slightly more than one-half the wool in the grease purchased for New England manufacture in 1925 was of domestic origin, and slightly less than one-half came from foreign countries. These proportions reflect, in general, the sources for the country as a whole, although imported stocks in 1925 made up more than half the total national consumption. In addition to raw wool the industry provides a market for a considerable volume of animal hair, cotton, recovered wool fiber, waste and noils, silk, and an increasing quantity of rayon, as well as substantial quantities of yarns. The importance of the specific materials purchased for manufacture by New England mills in 1925, and also in 1919 and 1914, is indicated in the following table, which gives all the figures that are available for separate States.

PRINCIPAL MATERIALS USED IN NEW ENGLAND WOOL INDUSTRIES IN 1925, 1919, AND 1914

[Thousands of pounds]

Material and States included	1925	1919	1914
Wool, in condition as purchased (Massachusetts, Rhode Island, Connecticut, New Hampshire, Maine):			
Total	274, 644	[1] 266, 684	[2] 262, 768
Domestic	143, 044	[3] 137, 131	[4] 149, 198
Foreign	131, 600	[1] 129, 552	[1] 113, 570
U. S. total	555, 263	491, 728	502, 857
Domestic	261, 893	253, 838	277, 588
Foreign	293, 370	237, 890	225, 269
Wool equivalent in scoured condition (Massachusetts, Rhode Island, Connecticut, Maine, New Hampshire):			
Total	169, 704	[1] 164, 387	[2] 157, 603
U. S. total	351, 067	295, 388	307, 706
Waste and noils of wool mohair, etc. (Massachusetts, Maine, New Hampshire, Connecticut, Rhode Island):			
Total	37, 986	[4] 26, 469	[2] 19, 553
U. S. total	59, 815	51, 481	50, 350
Recovered wool fiber (New Hampshire, Massachusetts, Maine, Connecticut, Rhode Island):			
Total	29, 356	[6] 24, 887	[2] 13, 574
U. S. total	40, 345	37, 532	30, 159
Cotton (Massachusetts, Maine, New Hampshire, Rhode Island):			
Total	19, 166	[6] 9, 727	[5] 17, 004
U. S. total	40, 188	22, 683	35, 307
Tops, purchased (Massachusetts, Rhode Island):			
Total	32, 585	18, 852	19, 332
U. S. total	46, 360	26, 467	29, 178
Animal hair (Massachusetts, Maine):			
Total	14, 125	[5] 15, 489	[4] 9, 200
U. S. total	69, 518	54, 340	44, 131
Yarns, purchased (Massachusetts, Connecticut, Rhode Island, Maine, New Hampshire):			
Total	80, 682	60, 074	72, 801
U. S. total	237, 579	171, 915	214, 451

[1] Excluding 6 establishments.
[2] Excluding 7 establishments.
[3] Excluding 3 establishments.
[4] Excluding 4 establishments.
[5] Excluding 2 establishments.
[6] Excluding 1 establishment.

PRINCIPAL MATERIALS USED IN NEW ENGLAND WOOL INDUSTRIES IN 1925, 1919 AND 1914—Continued

[Thousands of pounds]

Material and States included	1925	1919	1914
Yarns purchased (Massachusetts, Connecticut, Rhode Island, Maine, New Hampshire)—Continued.			
Worsted (Massachusetts, Rhode Island, Connecticut)—			
Total	35, 353	30, 124	[3] 38, 528
U. S. total	53, 820	47, 127	62, 895
Woolen (Massachusetts)—			
Total	3, 337	3, 316	3, 986
U. S. total	37, 246	25, 759	23, 802
Cotton (Massachusetts, Connecticut, Maine, Rhode Island, New Hampshire)—			
Total	24, 093	[6] 23, 119	[7] 23, 410
U. S. total	52, 001	46, 039	56, 988
Jute and other (Massachusetts)—			
Total	7, 882	2, 938	4, 790
U. S. total	85, 460	47, 389	61, 653
Rayon (Massachusetts)—			
Total	1, 598	6, 848	([8])
U. S total	2, 543	39, 990	([8])
Silk and spun silk (Massachusetts, Rhode Island):			
Total	215, 304	243, 463	311, 778
U. S. total	718, 845	542, 587	794, 693

[3] Excluding 3 establishments.
[6] Excluding 1 establishment.
[7] Excluding 5 establishments.
[8] Figures not available.

NOTE.—The table includes only data for States for which separate statistics are available.

BOSTON WOOL MARKET

Boston is the leading wool market of the United States and of the Western Hemisphere, and is outranked in total volume of sales only by London. Through the Boston market flows over 60 per cent of the wool consumed in the United States. Outside of Boston, next in importance is Philadelphia, and lesser market centers are Chicago and St. Louis. Philadelphia is especially important as a market for carpet wools. Although attempts have been made to develop wool-marketing centers in New York and Chicago, these places have never been able to cope with the advantages that have built up Boston's dominant position.

The preeminence of Boston as a market for raw wool is the logical result of its economic position. This is the most conveniently located center with respect to wool consumption. Practically all the large wool mills of New England are within a day's rail or trucking distance from Boston. There is an unusual combination of port facilities and storage capacity, with abundant warehouse space adjacent to tidewater for receiving and storing both foreign and domestic wool. Boston has sufficient warehouse space at the water front for an entire year's wool clip of the United States. Numerous public warehouses are available for storing imported wool, which is graded, for the most part, in the country of origin. In handling the domestic clip, where large floor space is required for opening and grading the wool, the great private warehouses are available.

On account of the great variation in grades of wool, not only between fleeces but even in the same fleece, precise grading is necessary. The stocks of wool for consumption in the United States are therefore concentrated in two or three wool centers, where they are classified and held in stock after grading, to be drawn upon as needed by the manufacturers. Actual inspection before purchase is the general practice in the wool market; hence, it has been found difficult to adhere to fixed standards as a basis for trading. No success has been attained in establishing a market for wool futures as has been done in cotton futures.

The Boston wool market not only serves as a reservoir for supplying the manufacturer's needs but also serves largely to finance the wool clip of the entire country. A large part of the United States production is handled by dealers on a consignment basis. This usually means a cash advance to the growers, running up to 60 per cent of the value. The cooperative marketing of wool by the growers is as yet relatively unimportant. According to the United States Department of Agriculture, a total of only about 20,000,000 pounds of domestic wool was marketed through growers' cooperatives in 1927, representing approximately 6 per cent of the United States wool clip of that year.

The importance of the Boston wool market in the country's wool industry is indicated in the following table of annual wool consumption in the United States, and of Boston receipts and shipments, as compiled by the Boston Grain and Flour Exchange.

United States Consumption of Wool, 1918–1927, and Shipments and Receipts at Boston, 1914–1927

Year	Total annual United States consumption of foreign and domestic wools (grease equivalent, in thousands of pounds)			Annual receipts and shipments of wool at Boston (grease-wool receipts, in thousands of pounds)			Shipments reported, all wools, thousands of pounds
	Domestic	Foreign	Total	Domestic	Foreign	Total	
1927	311, 505	240, 023	551, 528	218, 189	123, 359	341, 549	199, 725
1926	248, 525	261, 508	510, 033	169, 270	177, 661	346, 931	201, 182
1925	265, 326	260, 959	526, 285	131, 447	174, 173	305, 619	168, 403
1924	281, 964	255, 796	537, 760	200, 239	121, 785	322, 025	170, 993
1923	249, 920	391, 688	641, 608	144, 137	271, 966	416, 103	148. 880
1922	374, 666	279, 460	654, 126	190, 952	242, 856	433, 808	102, 458
1921	290, 283	239, 211	529, 494	143, 720	199, 352	343, 072	115, 197
1920	251, 295	327, 543	578, 838	105, 707	168, 357	274, 063	136, 040
1919	304, 651	322, 233	626, 884	213, 905	265, 112	479, 017	149, 646
1918	293, 142	448, 575	741, 717	183, 297	320, 180	503, 477	200, 558
1917				210, 125	296, 461	506, 586	279, 851
1916				205, 195	234, 998	440, 193	302, 868
1915				181, 701	247, 914	429, 615	272, 473
1914				190, 731	144, 145	334, 876	267, 149

The wool dealers play an important part also in financing the manufacturers. The prevailing terms of sale to the mills provide for payment in 60 days. The financing of these wool stocks to the growers as well as to the mills is done through Boston banks, largely with notes and on personal security rather than through the use of warehouse receipts. The large financial resources of Boston banks and the prestige which wool dealers enjoy with them thus constitute an important factor in the operation of the wool market.

The number of wool dealers and brokers in the Boston market is estimated to be about 300. The bulk of the domestic business is now carried on by 25 or 30 large houses. The generally depressed condition of wool manufactures since 1923 has naturally affected the activities and the prosperity of these dealers in the wool market.

The Boston wool market handles not only foreign and domestic grease wool but also semimanufactures, consisting of tops, noils, and waste. Most of the large New England mills find it to their advantage to do their own wool scouring, but some independent establishments adjacent to the wool market do scouring for manufacturers or dealers on contract.

A great deal of raw wool now moves from the Boston market to the mills by motor truck. The large mills have their own fleets of trucks and buy the wool f. o. b. Boston, thus enabling them to obtain immediate deliveries of the size of shipment desired for current manufacture. Many mills carry small stocks and depend upon the wool dealers to meet their current requirements, especially in the recent years of short-order buying. The market thus, in addition to warehousing and grading the wool, performs the important function of financing and holding it for the manufacturer's needs.

The wool manufacturers of the country have in recent years become better organized than heretofore, as is evidenced in the formation of the Wool Institute. Through their various associations the woolgrowers of the country have likewise been strengthening their marketing position by organized effort. The wool dealers who stand between these two groups have thus far shown little tendency to organize their activities in concerted effort. The prevailing method of trading is by private individual sale.

PRINCIPAL PRODUCTS

The suitings, dress goods, overcoatings, and cloakings made by New England mills represented approximately two-thirds of the national value in 1925 and comprised about 60 per cent of the value of all New England wool manufactures. The value of wool yarns produced for sale in the four principal producing States of this section represented more than 53 per cent of the United States total for wool yarns in that year and comprised upward of 18 per cent of the value of all wool manufactures of New England. The quantity and value of the principal wool products in 1925, 1923, and 1921 are shown in the following table, as far as is possible to present individual State figures. Although not to be regarded as complete, this table indicates, for the major fabrics, New England's position in the United States production.

PRINCIPAL PRODUCTS OF NEW ENGLAND WOOL INDUSTRIES, QUANTITIES AND VALUES, 1925, 1923, AND 1921

[All figures in thousands]

Product and State	1925	1923	1921
Suitings, dress goods, overcoating, and cloakings (Massachusetts, Rhode Island, Maine, Connecticut, New Hampshire):			
Pounds	[1] 180,076	[2] 212,395	[3] 165,262
Square yards	315,897	342,901	304,437
Value	$372,750	$437,395	$335,996
U. S. value	[1] $566,675	[2] $657,308	[3] $501,895
Yarns for sale (Rhode Island, Massachusetts, Maine, Connecticut):			
Pounds	66,961	76,202	55,572
Value	$112,969	$128,027	$81,368
U. S. value	$211,537	$253,496	$161,427

[1] Exclusive of 2 establishments.
[2] Exclusive of 3 establishments.
[3] Exclusive of 1 establishment.

PRINCIPAL PRODUCTS OF NEW ENGLAND WOOL INDUSTRIES, QUANTITIES AND VALUES, 1925, 1923, AND 1921—Continued

[All figures in thousands]

Product and State	1925	1923	1921
Satinets and linseys (Massachusetts):			
Pounds	3,815	2,313	1,417
Square yards	6,136	3,631	2,737
Value	$2,208	$1,280	$864
U. S. value	$4,244	$2,278	$1,525
Blankets, cotton warp [4] (Maine):			
Pounds	4,543	2,049	1,888
Square yards	7,849	3,526	3,067
Value	$3,218	$1,412	$1,506
U. S. value	$7,411	$6,149	$6,109
Other woolen and worsted woven goods (Massachusetts, Maine, Connecticut, New Hampshire):			
Pounds	28,820	30,303	15,368
Square yards	51,591	64,876	39,051
Value	$58,032	$51,548	$30,063
U. S. value	$84,832	$75,479	$44,190
Carpets and rugs (Massachusetts):			
Square yards	8,302	9,687	8,330
Value	$23,368	$23,316	$10,824
U. S. value	$183,008	$192,157	$100,038
Felt goods (Massachusetts, Connecticut):			
Pounds	11,954	16,529	8,685
Value	$11,437	$12,297	$7,130
U. S. value	$40,591	$39,889	$22,309
Noils and wool waste (Massachusetts, Rhode Island):			
Pounds	26,967	32,761	22,637
Value	$10,806	$11,778	$5,359
U. S. value	$18,167	$19,362	$9,587
Other products and amounts received from contract work (Massachusetts, Rhode Island, Connecticut, Maine):			
Value	$32,432	$25,831	$17,700
U. S. value	$62,513	$48,240	$29,228

[4] Not including horse blankets.

NOTE.—This table includes only data for States for which separate statistics are available.

WOOLENS AND WORSTEDS

EARLY DEVELOPMENT

Wool manufacturing has had quite a different history in the United States from that of cotton manufacture because of different developments in the manufacturing processes. Wool products form two distinct classes of goods, based upon different processes in spinning the yarn, which result in different types of fabrics. The processes of weaving are practically the same for both. Goods made from yarn which has been prepared for spinning by carding the wool fibers form woolen fabrics. When combing processes are used to make the wool fibers lie parallel so as to permit spinning a hard, firm yarn, the product is known as worsted. The processes of manufacture for these two types of yarn are quite distinct and require very different kinds of machinery.

The early development of wool manufactures was mainly in the making of woolen goods. Worsteds did not attain commercial importance until after the invention of power machinery for combing wool—about 1860.

Weaving of woolen cloth was a household industry until well after the beginning of the nineteenth century. The early wool mills were the outgrowth of fulling mills, which had been established as small local enterprises to prepare the coarse homespun cloth for wear by special processing. Fulling mills date from 1643, when the first one in New England was established at Rowley, Mass. Various others followed in Connecticut, New Jersey, Pennsylvania, and Virginia. The first fulling mill to utilize water power was set up in Byfield, Mass., in 1794.

The first American wool mill containing more than a single loom was established at Hartford, Conn., in 1788. This was soon followed by several others, and by 1810 there were 24 wool mills in the United States. These were all small concerns, the largest establishment making wool cloth, located at Humphreysville (now Seymour), Conn., giving employment to 150 people. After the war of 1812 small wool mills appeared everywhere in the United States and in the western Territories. The early wool-manufacturing industry, however, had a short-lived prosperity because of the competition of imported British goods.

The outstanding development of wool manufacturing as a New England industry dates from shortly before the Civil War period. Notable changes then took place in types of raw wool available for manufacture and in processes for making wool cloth. Previously almost all the wool yarn was made directly from carded stock, and not combed, first, because of the lack of long-staple wool in this country suitable for combing, and, second, because of the lack of combing machinery. The reciprocity treaty with Canada, which was in force from 1854 to 1866, gave this country a supply of long-staple wool, and about the same time a power wool-combing machine was invented by the British.

The first wool-combing machine in the United States was set up at Lawrence, Mass., in 1854. Prior to 1860 there were only three large producers of worsteds in New England. The Civil War was a great spur to the manufacture of worsted as a material for army uniforms. The scarcity of cotton also stimulated the use of wool in its place, and many cotton mills, finding themselves short of raw cotton, turned to the manufacture of worsteds. Some of these continued making worsteds after the war. The discontinuance of the Canadian reciprocity treaty cut off the supply of Canadian long-staple wool, but the development of improved machinery for cleaning wool, as well as the perfecting of combing machinery, made Argentine wools available for worsted manufacture. Because of these improvements in machinery, almost all types of wool could be combed by 1900, and could thus be used in the manufacture of worsteds. There was a continuous contest for many years between carded and combed fabrics as material for making men's clothing, but by 1890 the leadership of worsteds over woolens was definitely established; and by 1909 twice as much wool was used in worsted manufacture as in all other branches of the wool industries. Since the World War, however, woolens have increased in popularity at the expense of worsted fabrics.

The first worsted mills were large ventures, capitalized at about $1,000,000 each. The average investment per mill between 1870 and 1923 ranged from $100,000 to $500,000, while the investment in individual woolen mills rarely exceeded $100,000. In numbers of wage earners as well as output the worsted mills exceeded the woolen mills from three to five times. The manufacture of worsted goods is thus carried on mainly in large units, while the mills making woolen goods are much smaller.

The worsted mills of the country are now concentrated principally in Massachusetts, Rhode Island, Pennsylvania, and New Jersey; a few are located in Maine, Connecticut, and New York. The leading cities in this line are Lawrence, Providence, Philadelphia, and Passaic. The worsted industry is more localized than is cotton manufacture, and it is more complete in its organization; the raw material is received and completely fabricated into cloth, generally in one organization. Worsted manufacture duplicates the mechanical process of cotton manufacturing more closely than does woolen.

In the worsted industry labor-saving machinery has been installed much more generally than has been possible in the woolen mills. Men outnumber women in woolen manufacture by a large margin, while in the worsted manufacture more women are employed than men. Although the carded-wool business now has three times as much capital invested as in 1860, when it was supreme in wool manufactures, it has yielded place definitely to combed wool. Woolens have come into increased importance, however, in the past few years.

New England's position in the national output of these two lines of wool manufacture is approximately the same, its proportion of woolens being 63.7 per cent in 1925 and of worsteds 64.5 per cent. Although the number of woolen mills in New England was much greater than the number of worsted mills, the volume and value of worsted goods produced in this region was greatly in excess of the product of the woolen mills. The number of mills, however, is not significant. In number of establishments the New England woolen mills outnumbered the worsted mills by nearly 100, but in value of output worsteds exceeded woolens by more than $150,000,000. In 1925 there were 273 woolen mills, which employed 45,800 workers and added to the New England income some $91,000,000; but 170 worsted mills employed 65,700 workers and added to the New England income $129,000,000. In general, the size of woolen mills was thus much smaller than that of worsted mills, the average number of employees per woolen mill being 160, while for worsted mills it was 369.

GEOGRAPHIC DISTRIBUTION

The geographic distribution of these two branches of wool manufacture varies sharply in the different States, the proportion of woolen mills being much greater in the three northern States than in the rest of New England.

According to the Biennial Census of Manufacturers for 1925, there were in Vermont 16 woolen mills and only 1 worsted mill; in New Hampshire, 35 woolen mills and 4 worsted mills; in Maine, 53 woolen mills and 9 worsted mills; while Connecticut had 35 woolen mills and 14 worsted mills. In Rhode Island, however, the worsted mills predominated in number as well as in importance, with 66 establishments employing nearly 19,000 workers, in contrast with 28 woolen mills with fewer than 3,300 workers. In Massachusetts there were 81 worsted mills, which employed about 36,800 workers, while there were 106 woolen mills in the State which employed slightly more than 18,000 workers.

At different periods there have been pronounced contrasts between woolen mills and worsted mills in the number of establishments. The number of woolen mills showed a pronounced reduction in the years preceding 1914, from 350 in 1900 to 235 in the latter year. During the World War, however, the number of woolen mills increased materially, rising to 287 in 1919; from this the number fell off to 255 in 1921, but increased to 273 in 1925. The number of worsted mills shows almost an opposite trend, increasing from 109 in 1900 to 164 in 1914. During the war, however, the number fell off to 154 in 1919. This was followed by a postwar increase to 166 in 1921 and to 173 in 1923. There were 170 New England establishments making worsted goods in 1925.

LOCALIZATION WITHIN NEW ENGLAND

Approximately one-half of the total income of New England derived from woolen and worsted manufacture in 1925 was contributed by Massachusetts plants. Yet in Massachusetts wool manufactures represent less than 7 per cent of the State's total income for manufacturing. It is of approximately equal importance in Rhode Island and in Maine, representing in each instance about one-sixth of the State's total manufacturing income. Incomplete data indicate that wool manufactures of New Hampshire contribute about one-tenth of the State's total income from manufactures, and in the case of Vermont about one-twelfth.

The following table shows the status of woolen and worsted manufactures in the individual States, and New England's position in the national industry.

WOOLEN AND WORSTED MANUFACTURES IN INDIVIDUAL STATES OF NEW ENGLAND IN 1925

State and item	Establishments	Persons engaged		Wages and salaries, in thousands of dollars	Cost of materials, in thousands of dollars
		Total	Wage earners		
Massachusetts:					
Woolen and worsted	187	57, 610	54, 876	73, 021	200, 289
Woolen	106	19, 070	18, 091	26, 735	54, 725
Worsted	81	38, 540	36, 785	46, 286	145, 564
Rhode Island:					
Woolen and worsted	94	23, 331	22, 206	28, 559	99, 707
Woolen	28	3, 470	3, 283	5, 251	13, 866
Worsted	66	19, 861	18, 923	23, 308	85, 841
Maine:					
Woolen and worsted	62	12, 314	11, 789	16, 542	37, 432
Woolen	53	7, 739	7, 305	11, 018	24, 486
Worsted	9	4, 575	4, 575	5, 524	12, 946
Connecticut:					
Woolen and worsted	49	9, 588	8, 897	13, 335	30, 816
Woolen	35	6, 852	6, 470	9, 482	19, 541
Worsted	14	2, 736	2, 427	3, 853	11, 275
New Hampshire:					
Woolen	35	5, 632	5, 363	7, 493	17, 110
Worsted	4				
Vermont:					
Woolen	16	3, 070	2, 933	4, 046	9, 309
Worsted	1				
New England:					
Woolen and worsted	443	111, 545	106, 155	142, 996	394, 663
Woolen	273	45, 833	43, 445	64, 025	139, 037
Worsted	170	65, 712	62, 710	78, 971	255, 626
United States:					
Woolen and worsted	832	174, 708	165, 224	220, 170	620, 402
Woolen	503	71, 044	67, 056	94, 673	219, 618
Worsted	329	103, 664	98, 168	125, 497	400, 784
New England as per cent of United States:					
Woolen and worsted	53. 2	63. 8	64. 2	64. 9	63. 6
Woolen	54. 3	64. 5	64. 8	67. 6	63. 3
Worsted	51. 7	63. 4	63. 9	62. 9	63. 8

WOOLEN AND WORSTED MANUFACTURES IN INDIVIDUAL STATES OF NEW ENGLAND IN 1925—Continued

State and item	Value of products			Value added by manufacture		
	Thousands of dollars	State as per cent of New England total	Per cent of total manufactures in State	Thousands of dollars	State as per cent of New England total	Per cent of total manufactures in State
Massachusetts:						
Woolen and worsted	309, 528	50. 3	9. 0	109, 239	49. 6	6. 7
Woolen	93, 080			38, 355		
Worsted	216, 448			70, 884		
Rhode Island:						
Woolen and worsted	146, 646	23. 8	23. 6	46, 939	21. 3	17. 0
Woolen	21, 142			7, 276		
Worsted	125, 504			39, 663		
Maine:						
Woolen and worsted	64, 923	10. 6	17. 5	27, 491	12. 5	16. 5
Woolen	40, 002			15, 517		
Worsted	24, 921			11, 976		
Connecticut:						
Woolen and worsted	50, 605	8. 2	4. 0	19, 789	9. 0	3. 0
Woolen	32, 748			13, 207		
Worsted	17, 857			6, 582		
New Hampshire:						
Woolen	28, 906	4. 7	8. 8	11, 796	5. 4	8. 7
Worsted						
Vermont:						
Woolen	14, 328	2. 3	10. 4	5, 019	2. 3	7. 9
Worsted						
New England:						
Woolen and worsted	614, 936	100. 0	10. 0	220, 274	100. 0	7. 5
Woolen	230, 206			91, 170		
Worsted	384, 730			129, 104		
United States:						
Woolen and worsted	957, 790		1. 5	337, 389		1. 3
Woolen	361, 524			141, 906		
Worsted	596, 266			195, 483		
New England as per cent of United States:						
Woolen and worsted	64. 2			65. 3		
Woolen	63. 7			64. 2		
Worsted	64. 5			66. 0		

MACHINERY USED

The number of cards, wool-combing machines, spindles, looms, and other equipment used in woolen and worsted manufactures in each State of New England, as reported for 1925, is shown in the following table.

MACHINERY USED IN NEW ENGLAND WOOL INDUSTRIES IN 1925

State	Cards	Wool-combing machines	Producing spindles	Power looms	Pickers	Garnett machines
Massachusetts	1, 583	991	587, 153	32, 735	317	54
Rhode Island	284	491	132, 656	8, 580	44	8
Connecticut	556	31	214, 415	5, 576	82	22
New Hampshire	438	96	147, 044	4, 147	57	4
Maine	562	36	217, 599	5, 183	132	6
Vermont	134	4	63, 563	1, 793	47	4
New England	3, 557	1, 649	1, 362, 430	58, 014	679	98
United States	6, 140	2, 733	2, 258, 436	90, 841	1, 125	206
New England as per cent of United States	57. 9	60. 3	60. 3	63. 9	60. 4	47. 6

An indication of the extent to which this equipment has been used in active production is afforded by the following table, which shows for the country as a whole the activity of wool-working machinery in each year from 1923 to 1927, as a percentage of maximum capacity. This table shows that in the past few years the available equipment has been far in excess of that employed in actual production.

ACTIVITY OF WOOL-WORKING MACHINERY IN THE UNITED STATES 1923–1927

[Average total hours operation expressed as percentage of maximum single-shift capacity]

Year	Broad looms	Narrow looms	Carpet and rug looms	Cards	Combs	Spinning machines	
						Woolen	Worsted
1927	61.9	63.0	64.1	79.5	80.0	77.7	67.0
1926	62.7	60.6	63.5	77.1	78.7	73.3	69.0
1925	69.0	63.6	71.8	85.5	77.2	34.6	66.3
1924	68.5	61.6	65.9	88.1	80.0	85.0	65.8
1923	82.5	76.2	82.2	98.5	97.4	92.1	91.5

Source: U. S. Bureau of the Census.

The amount of machinery in active operation has been undergoing considerable reduction. The total number of looms in active operation in 1928 and their distribution in the different States of the Union, as compiled by the Wool Institute, are shown below. According to these recent figures there were 64,700 power looms in regular operation in the woolen and worsted mills in the country in 1928, and of this number there were 44,857 in the six New England States.

POWER LOOMS IN OPERATION, JULY, 1928

New England: Total	44,857
Massachusetts	28,469
Rhode Island	5,910
New Hampshire	3,303
Connecticut	3,153
Maine	3,039
Vermont	983
Outside New England: Total	19,843
New Jersey	6,432
Pennsylvania	6,171
New York	2,009
Ohio	1,988
Tennessee	712
Outside New England—Contd.	
Georgia	361
Wisconsin	309
South Carolina	301
Indiana	301
Illinois	225
Michigan	210
Oregon	198
Virginia	196
Maryland	172
West Virginia	82
California	67
Minnesota	56
Utah	53
Total United States	64,700

TREND OF MANUFACTURE

Throughout the 45-year period from 1880 to 1925 New England has maintained, quite uniformly, its national position as a maker of woolens and worsteds. The total number of establishments in this section was exactly the same in 1925 as in 1909.

There was a net increase after the World War—from 421 establishments in 1921 to 448 in 1925. The year of greatest activity, as shown by the number of persons engaged, by the outlay for materials, and by the value of the product, was 1923. Although the activity in 1925 was greater than in 1919, it showed a substantial reduction below the maximum attained in 1923. The trend of activity is indicated by the following table, giving statistics for each census year. It should be borne in mind that no account is taken of changes in the value of the dollar in different years.

NEW ENGLAND COMPARED WITH THE REST OF UNITED STATES IN WOOLEN AND WORSTED MANUFACTURES, 1880–1925

Census year	Establishments		Persons engaged			Salaries and wages		
						Thousands of dollars		
	New England	United States outside New England	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States
1925 [1]	443	389	111, 545	63, 663	63. 7	142, 996	79, 681	64. 2
1923 [2]	441	410	129, 394	75, 242	63. 2	164, 705	89, 355	64. 8
1921 [3]	421	393	109, 939	61, 939	63. 9	130, 948	70, 294	65. 1
1919 [4]	424	428	111, 173	65, 000	63. 0	127, 923	71, 168	64. 3
1914 [5]	382	417	103, 955	60, 735	63. 1	56, 147	30, 353	64. 9
1909 [6]	448	537	110, 176	64, 688	62. 9	53, 828	28, 696	65. 2
1904 [7]	454	564	92, 150	54, 360	62. 9	40, 686	20, 747	66. 2
1900 [8]	459	762	76, 009	54, 456	58. 3	31, 034	19, 092	61. 9
1890 [9]	485	969	69, 113	53, 831	56. 2	26, 193	18, 166	59. 0
1880	529	1, 537	59, 712	45, 595	56. 7	18, 829	35, 486	41. 5

Census year	Cost of materials			Value of products			Value added by manufacture		
	Thousands of dollars			Thousands of dollars			Thousands of dollars		
	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States
1925 [1]	394, 662	225, 740	63. 6	614, 936	342, 854	64. 2	220, 274	117, 114	58. 4
1923 [2]	399, 121	223, 611	64. 1	687, 530	375, 028	64. 7	288, 409	151, 417	65. 6
1921 [3]	270, 004	130, 042	67. 5	488, 406	267, 178	64. 6	218, 402	137, 136	61. 4
1919 [4]	424, 069	241, 526	63. 7	675, 495	389, 939	63. 4	251, 426	148, 413	62. 9
1914 [5]	154, 201	92, 296	62. 6	237, 388	142, 096	62. 6	83, 188	49, 800	62. 6
1909 [6]	177, 176	105, 702	62. 6	275, 648	160, 331	63. 2	98, 473	54, 629	64. 3
1904 [7]	129, 896	67, 593	65. 8	201, 315	106, 627	65. 4	71, 419	39, 033	64. 7
1900 [8]	90, 631	57, 456	61. 2	146, 364	92, 381	61. 3	55, 733	34, 924	61. 5
1890 [9]	77, 927	55, 050	58. 6	124, 658	88, 115	58. 6	46, 730	33, 066	58. 6
1880	71, 703	111, 413	39. 2	116, 355	177, 830	62. 6	44, 652	26, 645	62. 6

[1] Exclusive of 4 worsted establishments in New Hampshire and 1 in Vermont.
[2] Exclusive of 1 worsted establishment in New Hampshire and 1 in Vermont.
[3] Exclusive of 2 worsted establishments in Vermont.
[4] Exclusive of 1 worsted establishment and 17 woolen establishments in Vermont.
[5] Exclusive of 1 worsted establishment and 16 woolen establishments in Vermont.
[6] These figures include felt goods and wool hats.
[7] No worsted goods establishments in Vermont.
[8] Exclusive of 2 worsted establishments in New Hampshire and 1 in Vermont.
[9] Exclusive of 2 worsted establishments in Maine.

PRESENT CONDITIONS

New England woolen and worsted manufactures have shared the general fortunes of these industries throughout the country, and their experiences in the last few years have run generally parallel to those of cotton manufactures, although resulting from different conditions.

The problems of this industry arise not so much from outside competition as from internal conditions, which have resulted largely from the individualized nature of a great portion of wool manufacture. This is true especially of a large number of smaller woolen mills, which have been handicapped by lack of facilities for anticipating market requirements, or of knowledge of manufactured stocks available to supply the market. In consequence of the curtailed consumption of wool fabrics in recent years, especially in women's wearing apparel, some mills changed to the manufacture of men's fabrics, in which consumption has been more sustained. The result was intensive competition in men's fabrics, resulting from excess production and keen price rivalries.

The marketing structure for wool manufactures differs materially from that for cotton goods, because the processes for finishing wool goods for final consumption are carried on largely by the mills which produce the cloth. The most important markets for woven woolen and worsted fabrics are the clothing centers of the country; a large part of the mill sales are direct to garment makers.

The wool-manufacturing industry in the past has been quite unorganized and has suffered wide fluctuations in its fortunes, perhaps as a result of its lack of organization. Pronounced market variations and irregular production have been conspicuous, with prices falling frequently below costs of production. Changes in the market situation resulting from the increased importance of the style factor, changes in demand from piece goods to ready-to-wear garments, and the general institution of small-scale buying for current needs have affected this industry in much the same way as they have affected cotton and the other textiles.

THE WOOL INSTITUTE

An outstanding achievement of the wool-manufacturing industries of the country was the establishment of the Wool Institute in 1927. This is a voluntary association of woolen and worsted manufacturers, representing in its membership about 60 per cent of the active looms of the country. Its purpose has been to bring together individual manufacturers and to undertake, by concerted effort, to work out the solution of common problems of production and marketing.

Important in its program have been efforts to assist its members in determining their actual costs of manufacture by adopting a simple and uniform plan of cost accounting. An outstanding feature is consistency in adhering to the prices announced by the individual members as a means of avoiding the destructive price cutting that has formerly had a demoralizing effect in the industry. Information regarding the stocks of manufactured goods on hand is obtained periodically from the members and is made available to them as a guide for planning future production.

This association of wool manufacturers has accomplished a great deal by making it possible for the individual manufacturers to become acquainted with one another and by assisting them to understand and meet the marketing problems common to their industry.

It has already aided greatly in stabilizing production, by its service in providing information regarding the volume of surplus stocks and market conditions as a guide for individual action.

EXPERIENCES OF MANUFACTURERS

WOVEN FABRICS

One hundred and thirty-six New England manufacturers of woven woolen and worsted fabrics replied to special inquiries from the Department of Commerce regarding their manufacturing and marketing practices in the last few years. Each of the States was well represented. Fifty-two replies were received from Massachusetts, 21 from Connecticut, 17 from Rhode Island, 15 from New Hampshire, 14 from Maine, and 7 from Vermont. As the information was fragmentary or incomplete in a number of cases, however, the present analysis is confined to 120 companies whose replies were fairly complete. These represented a total volume of sales in 1925 of nearly $179,000,000, making up approximately 30 per cent of the total value of products reported in the census for that year.

Factors influencing location in New England.—The reason most frequently given by these manufacturers for favoring New England was labor conditions, followed in order by marketing facilities, accessibility of raw materials, transportation facilities, and banking or financial advantages. Water power was mentioned by a considerable number as the original determining factor in the location of their mills, while a number of others referred to the abundance of water necessary for processing as a determining factor. These two factors, together with a near-by supply of native-grown wool and the supply of local labor, were of principal importance in the early development of the woolen industry in New England.

Products of the industry.—The main products reported by these manufacturers were woolen and worsted suitings, overcoatings, dress goods, flannels, and shirtings. Several of the companies made a feature of automobile cloths or robes, and four of them mohair, plushes, and linings. Special products include casket cloth, bunting, billiard cloth, uniform cloth, pile fabrics, reworked wool, yarn, noils, and waste.

In a number of cases changes have been made in the kind of products manufactured to meet changes in the demand for goods. Two manufacturers reported change from fabrics for men's wear to women's wear, and several had changed from worsted goods to woolen goods, while others had made an opposite change. One mill changed from fancy cotton goods, while another was formerly a felt mill. A manufacturer of cotton-warp suitings and overcoatings formerly specialized in horse blankets. One former manufacturer of broadcloth, cassimeres, and blankets changed to overcoatings and suitings for women's wear, while another concern making wool cassimeres changed to flannel and broadcloth. A Vermont manufacturer of cotton-warp wool overcoating formerly made yarn for home knitting and later all-wool blankets. A large establishment in Maine, which now specializes in fabrics for light-weight summer clothing and automobile cloth, formerly made yarns, astrakhans, and cloakings. A Massachusetts concern formerly doing custom work changed to the manufacture of woolen cloth, while a Connecticut manufacturer reports a change from fancy goods to staples.

Materials used.—The principal materials reported by the manufacturers are raw and scoured wool, woolen yarn, worsted yarn, cotton and cotton yarn, merino yarn, silk and rayon yarn, together with wool waste, cotton waste, noils, reworked wool, mohair, chemicals, dyestuffs, and soap. These materials are bought, for the most part, within New England. Woolen and worsted yarns as well as cotton yarns are obtained from local mills, while raw wool is supplied principally from the Boston market, although Philadelphia is mentioned in one or two instances. A large portion of this raw wool is imported from Australia, South America, South Africa, and India. A portion comes from the Western States.

Age of establishments.—That the woolen industry has been long established in New England is indicated by the fact that over one-third of the firms reporting have been in operation for 50 years or more. There were 10 concerns between 75 and 100 years of age, and 11 companies had been in operation for over a century. Forty-five of the establishments had come into existence within the preceding 25 years, and 17 of these within 10 years.

Changes in management within the preceding 25 years were reported by 55 concerns. Twenty-two of these had undergone change in the period between 1900 and 1920, while 17 others had experienced changes in management since 1921. Some of these changes represented simply incorporation of previous companies, but the majority of cases indicated a change of ownership.

A total of 32 branch plants was reported by 19 companies, all these branches being located in New England. The greater part of these branches have been long established. One company reported 5 branches, one 4 branches, and one reported 3; while four reported 2 branches each, and 12 other companies had 1 branch each.

Size of companies.—Of the 120 firms giving sales figures for 1925, 56 firms, representing nearly one-half of the total number, account for over four-fifths of the $179,000,000 reported; and 11 of the larger firms, whose individual sales ranged from $3,000,000 to $16,000,000, account for over two-fifths of this total. The most representative size of business was that with annual sales ranging between $1,000,000 and $3,000,000, as 46 companies fall within this range. There were 32 concerns reporting sales between $500,000 and $1,000,000, whose total made up about one-eighth of the full amount, and 29 firms between $100,000 and $500,000 accounting for only one-twentieth. Besides these there were three small firms whose total was negligible. The prevailing size of establishment is in the range between $500,000 and $2,000,000, over half of the total number falling within this grouping. For the 120 reporting companies the average sales in 1925 amounted to $1,529,000.

Employment figures submitted by 126 companies show that 76 of these, comprising three-fifths of the total number, employed from 100 to 500 persons each. Thirty-seven companies employed fewer than 100 persons each, and 13 establishments employed from 500 to a maximum of 3,600 each. There were seven companies reporting the employment of over 1,000 persons each.

The total employment for 1925 reported by these 126 companies was 35,548 persons, of which 47 per cent were in the 13 large mills employing over 500 persons, and 36 per cent in the 7 largest establishments employing over 1,000.

Plant operation.—Increases in plant capacity since 1921 were reported by 40 companies, these increases ranging from slight additions up to a doubling of capacity. One company reported a 400 per cent increase. Eight establishments reported a doubling of capacity, 3 others a 50 per cent increase, 14 others increases from 25 to 50 per cent, and several others smaller amounts.

A Massachusetts manufacturer of men's worsteds and automobile cloths, doing a business of over $2,000,000, quadrupled his plant capacity, while another manufacturer of automobile cloths in the same State, doing a business of $750,000, reported a 100 per cent increase. A Massachusetts manufacturer of reworked wool, doing custom work of $100,000, doubled his plant capacity. A Rhode Island manufacturer of worsted suitings doing nearly a $2,000,000 business reported a 200 per cent increase, while another concern in the same State weaving worsteds for making men's wear, whose business of nearly $500,000 has shown pronounced growth, reported that the capacity of the plant had been increased over 100 per cent since 1923 by consecutive additions. Another large manufacturer of worsted cloth, waste, and noils in Rhode Island, whose sales have shown pronounced increases each year since 1921, reported some additions each year. This executive says, "We believe in New England."

A Vermont manufacturer of woolen goods, doing nearly a $1,000,000 business, reported the addition of a spinning and carding plant, with operation day and night. A Massachusetts manufacturer of woolen cloth, with knitted goods as a secondary line, with sales of nearly $2,000,000, built a complete new plant in 1921. One of the largest manufacturers in New England reported substantial additions of cards, combs, frames, and looms at intervals since 1922.

Relation of 1925 output to maximum capacity.—Of the 122 companies indicating plant operation, one-fourth reported running at full capacity in 1925, while one-third of the total operated at 90 per cent or better. There were 35 companies reporting from 75 to 90 per cent of full capacity, and 38 others from 50 to 75 per cent. Nine manufacturers reported operations at less than one-half of maximum capacity.

Sales trend, 1921 to 1925.—The total sales reported by 105 companies, amounting in 1925 to upward of $160,000,000, show an increase over 1921 of 23.5 per cent. Among the individual concerns were 76 companies whose sales showed an increase for this period averaging 63 per cent, their aggregate sales in 1925 amounting to $111,000,000; while there were 29 companies with aggregate sales in 1925 of $48,000,000, which showed a decrease averaging 20.6 per cent from 1921.

The period from 1921 to 1923 showed for 106 firms, whose total sales in the latter year were $169,000,000, an increase of 30.5 per cent over 1921. In this shorter period there were 86 firms, whose aggregate sales in 1923 were upward of $140,000,000, which made individual increases over 1921 with an average rate of 42.8 per cent; while there were 20 firms, with aggregate sales of $28,000,000, which decreased individually, with an average falling off of 10.6 per cent from 1921.

The period from 1923 to 1925 showed a net falling off in total sales of 2.7 per cent, as represented by 116 companies, whose sales in 1925 totaled $175,658,000. Most of this decrease took place in 1924, when there was a decrease of about 5 per cent from 1923; while 1925 showed an increase of approximately 2 per cent over 1924. Among individual companies there were 63 with total sales in 1925 of a little less than $81,000,000 which showed individual increases, with an average rate of 36.4 per cent over 1923; while there were 53 firms with aggregate sales in 1925 of nearly $84,000,000, whose individual sales decreased at an average rate of 24.6 per cent; there was also one firm doing a $10,000,000 business whose sales in 1925 were about the same as in 1923. For the individual years there were 62 companies, with aggregate sales in 1924 of nearly $87,000,000, whose sales increased from the preceding year, with an average rate of 22.3 per cent; while there were 53 companies, representing an aggregate of nearly $84,000,000, whose individual sales decreased with an average rate of 21.8 per cent below 1923. In 1925, out of 118 firms with total sales of approximately $179,000,000, there were 67 firms whose aggregate sales were $114,000,000 which increased over 1924 with an average rate of 19.9 per cent; while there were 50 firms, with aggregate sales of $62,500,000, which fell off from 1924 an average of 19.5 per cent; and one firm, with sales of $600,000 in 1925, which showed no change from 1924.

Location of sales.—The overwhelming proportion of woven wool fabric is marketed outside of New England. This is not surprising, since New England is the national center of wool manufacturing.

The chief market for wool fabrics is in the great clothing manufacturing centers of the country. New York City, in particular, is the headquarters for the specialists in this line. Since the prevailing method of marketing is through selling agents, it is impossible to ascertain from the manufacturers the actual place where their product is consumed. A number of manufacturers reported sales in the Middle West, several mentioned sales on the Pacific coast, and a few sell in the Southern States. The chief centers of consumption outside New York City are Chicago, Rochester, Baltimore, and Philadelphia.

Over half the companies stated that less than 10 per cent of their sales are made in New England. Only 10 companies reported New England sales in excess of 25 per cent, while 4 stated that they sell one-fourth to one-half of their products in New England, 2 others from one-half to three-quarters, and 4 sell their entire production there. Of 73 companies indicating sales in New England 18 stated that they are increasing their business in that region, while 31 reported a decrease of New England sales and 24 said there was no change.

No direct exports of any consequence are indicated in the replies. One small company making cotton-warp woolen reported 2 per cent exports; a $5,000,000 company making special woolen fabrics reports 1 per cent, and three other medium-sized concerns indicate 1 per cent or less.

Trade-marks and advertising.—The use of trade-marks for branding the product is prevalent among the manufacturers replying. Of 94 concerns indicating their practice in this respect, 73 stated that the majority of their product is trade-marked, and 62 of these brand their entire output. Advertising, however, does not appear to be a common practice. Of 100 companies replying to this question, 77 stated that they do no advertising, while 16 reported advertising in national mediums, and 7 reported the use of local advertising. The principal advertising mediums were reported to be trade journals. This low representation of advertising is doubtless explained in large measure by the method of marketing the product, since sales are for the most part left in the hands of separate agencies.

Channels of distribution.—Most of the concerns market their products through a single agency, and that is the commission selling agent. Out of 111 replies, 81 indicated selling houses in New York, while 18 reported direct sales to wholesalers and 8 reported direct sales to manufacturers of clothing. Three companies reported sales through exclusive wholesalers, while only one reported sales entirely through retailers. Wholesale and merchant tailors, and manufacturing tailors are the main outlets.

WOOL YARN

In addition to the foregoing information from makers of woven wool fabrics, replies were received from 28 manufacturers who specialize in woolen, worsted, or mohair yarns. These concerns, in general, run parallel to the manufacturers of woven goods, except in the method of marketing their products. As the principal market for yarn is found among the manufacturers of woven goods, the yarn manufacturers produce in large measure for a near-by local market.

Size and location of plants.—Of the 28 yarn manufacturers reporting, 14 are located in Rhode Island, 11 in Massachusetts, and 1 each in Maine, New Hampshire, and Connecticut. The total sales of the 25 companies which gave figures for 1925 aggregated $41,192,000, and the total employment of 27 concerns indicating this item amounted to 6,911 persons. Fifteen of these companies reported individual sales in 1925 of over $1,000,000 each, making up over 90 per cent of the total reported sales, and there were 6 companies with sales over $2,000,000, which account for 55 per cent of the total. There were 9 companies with sales under $1,000,000 each, including 2 between $500,000 and $1,000,000, 6 between $100,000 and $500,000, and 1 under $100,000. The average size of annual sales for the 25 companies was $1,648,000, and the average employment was 256 persons per company. Ten companies employing between 250 and 1,000 persons each made up 73 per cent of the total employment, and 4 of these employing over 500 persons each made up 43 per cent; while 11 companies employing between 100 and 250 persons each made up 23 per cent, and 6 companies employing under 100 persons each accounted for only 3 per cent of the total employment.

These manufacturers of wool yarn, as a group, do not appear to have been as long established as the makers of woven fabrics. Only one of these yarn concerns had been in existence longer than 50 years, while 18 had been established within 25 years. Of the latter, 9 had come into existence within 10 years, and there were 2 companies established since 1921. Recent changes in management were indicated in 8 instances, of which 5 took place within the last five years. Two establishments reported a change from the original product, in one case from carpet manufacturing to yarn manufacturing, and in another from garnetting. Three of the establishments reported branch plants, one company having 3 branches, and two others having 1 each, all located in New England.

Increases in capacity of plants since 1921 were reported in 10 instances. Two concerns had doubled their capacity, one had increased it 150 per cent, one 78 per cent, two 50 per cent each, and three others lesser amounts, while another reported the construction of a new plant. The ratio of operation in 1925 to the maximum capacity runs generally parallel to that shown by the manufacturers of woven goods. Of 23 concerns indicating this, there were 11 operating at 75 per cent or upward and 9 others between 60 and 75 per cent. One reported operating at 50 per cent and another at 40 per cent. One manufacturer stated that plant operation was maintained above maximum capacity by means of night shifts.

Location of markets.—The location of markets was indicated by 26 companies; 15 of these reported the majority of their sales made in New England, and 11 of these sold three-quarters or more in that region. Eleven market less than one-half of their products in New England; of the latter 8 reported from one-fourth to one-half, 2 less than one-fourth, and 1 none. The only States outside of New England mentioned in any of the replies were the Middle Atlantic States, and most of the replies indicated these in addition to New England. Ten manufacturers reported their sales in New England to be decreasing, while 6 others reported an increase and 4 said there was no change in their sales in New England.

Distribution of products.—Distribution of the products of wool-yarn manufacturers depends to a large extent upon the commission agent, as was the case with the woven fabrics. Of 20 manufacturers who reported the use of only one channel of distribution, 8 reported sales through commission agents only and 8 others direct to manufacturers only, while 3 reported selling their entire product through wholesalers, and 1 other through an exclusive distributor. In seven instances the manufacturer used more than one of these channels.

Trade-marks and advertising.—The use of trade-marks appears less prevalent than in the case of woven fabrics. Eight companies reported that their entire product is trade-marked, while 6 stated that none of it is branded and 14 made no reply to this question.

As regards the use of advertising, 12 companies replied in the affirmative, the principal mediums being trade journals, while 2 reported newspaper and magazine advertising and 1 direct mail. Seven companies stated that they do no advertising, while 9 others did not reply.

Trend of sales.—The general trend of sales for 22 companies giving complete figures, with aggregate sales in 1925 of $37,500,000, showed an increase of 39 per cent over 1921. In this total there were 70 firms whose individual sales showed increases, with an average advance of 58 per cent over 1921, and 5 firms, with total 1925 sales of about $5,000,000, which showed individual losses, the average decrease being 21.5 per cent compared with 1921. All but four of these companies had an increase in sales from 1921 to 1923, and the falling off of these four companies was relatively slight.

From 1923 to 1925 the aggregate sales of 23 companies, amounting in the latter year to $38,700.000, showed a decrease of 9.5 per cent from the 1923 total. In this interval, however, there were 12 companies, with sales of $21,500,000 in 1925, whose sales increased individually at an average rate of 18.9 per cent over 1923; while in the case of 11 other companies, with aggregate sales for 1925 somewhat in excess of $17,000,000, the individual sales fell off, the average rate of decrease being 30.2 per cent. The trend of sales of manufacturers of woolen yarn from 1921 to 1925, as indicated by the experience of these reporting companies, thus runs generally parallel to the trend for manufacturers of woven goods, who provide the consuming market for wool yarn.

Seasonal employment.—Figures of 134 New England mills making woven fabrics or yarns, showing the average number of employees on their pay rolls during quarterly periods in 1923 and 1925, show a variation between periods of minimum and maximum employment in 1923 of only 3 per cent, and in 1925 of 10 per cent, derived from the following totals:

In 1923:	Employees	In 1925:	Employees
January	45, 991	January	41, 887
April	46, 614	April	39, 456
July	45, 338	July	37, 841
October	44, 179	October	40, 640

The relatively slight variation at different seasons shown by these figures is in considerable measure the result of efforts of many mills to maintain uniform employment throughout the year by manufacturing stocks during slack periods or by developing supplementary lines.

Internal improvements.—Improvement is likewise noted among many of the New England woolen and worsted mills in recent years through the development of better methods of mill operation. Among these the prevention of accidents stands foremost, being mentioned in 91 instances, while in 72 cases it was stated that emphasis was placed upon the continuous maintenance of plant and equipment. More effective organization and control of production have also been emphasized. Standardization of products, materials, and equipment has likewise received some attention. Industrial research was mentioned in only 10 instances.

Relations between management and workers, which were mentioned frequently as showing improvement, are indicated by the degree to which incentive methods of wage payment are used, whereby the financial reward is made in proportion to the work accomplished, this having a tendency to keep unit cost low and more closely within the control of the management. Of all the mills reporting in this group 83 per cent indicated that they use incentive methods of wage payment, an average of 43 per cent of all factory employees working on a piecework or similar basis.

The following comments from individual manufacturers are typical of some of the results obtained by these improvements. One manufacturer states, "Continuous maintenance of our plant and equipment, together with standardization of materials and equipment, has resulted in a better product at lower price. Modern up-to-date machinery and better routing of work has cut cost." Another reports "standardization of all possible basis construction to allow instant change to other numbers of cloth to meet conditions instantly."

Rearrangement of machines and scrapping of old machinery are credited with improved production by another manufacturer, while in another instance limiting the number of patterns and controlling production have resulted in increased sales. Another company states, "Standardization of products on a limited line of patterns has given us 100 per cent production throughout the year." This experience is repeated in another case in the statement, "Cooperation between the management and workers and the standardization of products have made possible the continuous operation of plant on staple goods."

METHODS AND POLICIES

The attitude of progressive manufacturers in regard to the installation of new and up-to-date equipment is expressed in the following statements from leading millmen in response to a special inquiry. One executive says, "The policy of this company has been to adapt ourselves to new conditions as we saw them after the war, by the installation of new machinery; and we believe this has been the attitude of the industry in general in New England." Another executive says, "The policy of this company, for the last six or seven years anyway, has been to install, just as far as we are able, the most modern equipment—that which would keep our products up to change in demand and would reduce our costs. The result has been a substantial change in these years in the character of the product and machinery."

The statement of another executive is, "It has always been our policy to install new, up-to-date equipment to reach higher standards and maintain the ability to compete, and we believe that this policy is followed generally in New England." Another manufacturer reports as follows: "We have always tried to keep our equipment in good condition, buying new when we felt it had been tried and found to be a saving or an improvement in the manufacture of our goods. The general attitude in New England is somewhat conservative in textile lines, owing to present conditions." Another executive states, "This company has adopted a policy of gradually installing new and up-to-date equipment and will continue to carry out that policy until the entire plant is brought thoroughly up to date. This policy has been adopted in order to enable this company to reduce its costs and meet the competition existing in the textile industry to-day."

The comments of several other manufacturers run in a similar vein, although one executive reported that his company had no intention of putting in different equipment unless a special necessity should arise.

Reasons for changing sales trends.—Of the factors believed to be responsible for a falling off in the sales of woolen and worsted manufacturers, those mentioned most frequently were overproduction and changes in the general demand for wool fabrics. The high cost of labor was mentioned in a smaller number of cases, while competition from other sections of the country was mentioned as a cause in 18 replies. Where total sales had increased, the increase, in the greater number of cases, was credited to the development of new products or to the lowering of manufacturing costs. Development of new sales methods and the extension of sales territory were credited for this increase in a relatively small number of cases.

The influence of changes in the nature of demand and in methods of buying, of style changes and similar factors, and of the manufacturing and merchandising policies of New England mills is indicated in the following statements of experiences by some of the leading executives of this industry in New England.

One manufacturer of woven goods reports:

> The principal change which has come about is in adopting the policy of hand-to-mouth buying. Our goods go largely to manufacturing clothiers, and while this policy enables most of them and the retailers to carry much smaller inventories it works disadvantageously to the manufacturer, because frequently the orders do not come in during a season in sufficient quantity to keep the mill running at full capacity. Considerable business is lost to all branches of the industry by this policy, through inability to fill orders from the retailers in sufficient time for the season's trade. Now that the excessive demand caused by the war and postwar period is at an end, there is no question but that there is a capacity for production in the industry considerably in excess of demand. This condition, of course, brings about a very strenuous competition.

The effect of changes in buying practice is indicated as follows by another manufacturer:

> The buying has changed to a hand-to-mouth proposition. The buyer expects the other fellow to have it made up so that all he will have to do is to write in for an immediate delivery of whatever he needs. If he can not get delivery he will not give you the order until he has tried to get the same goods from some other manufacturer.

The difficulty arising from inability to manufacture for stock in the face of small-order buying is thus stated by another manufacturer:

> We find that the consumer demand is about the same in that their buying policies are all from hand to mouth, and, of course, this is to be expected with the rapid transportation facilities which are now available.
>
> We find that there are a few others who slash prices at various times because of having made up large quantities of stock goods. The only new market problems, as we see it, are in keeping up to the minute with requirements of the trade, which seem to change quite often.

Another executive says:

> While our customers used to buy in large quantities over a long period of time, to-day they only place orders from day to day. In other words, no longer do we find accumulations of stock in anybody's hands as we did find it.

This sentiment is amplified thus by another manufacturer:

> Consumer demand and buying policies have changed entirely during the last five years. Consumers are spending more money for autos, radios, etc., and are saving on clothing. This has created less buying in the textile line, over production in textile fabrics, a buyers' market with hand-to-mouth buying, and has thrown risks and burdens on the manufacturer's shoulders which he did not have in former times.

Another manufacturer reports that the demand for his products has decreased on account of fashion changes and that the buying policy of the consumer is changing more and more to a hand-to-mouth buying.

The importance of the changes which have taken place is thus emphasized by another manufacturer of woven-wool fabrics:

> The adoption by the manufacturing clothier and retail clothier of a hand-to-mouth buying policy, compared with the former policy of commitments made at the beginning of a season for the entire season, places a very large burden on the manufacturer, who is either compelled to guess at the particular fabrics that will be popular during a given season, and make goods up for stock in accordance with this guess, or to create manufacturing facilities far in excess of the need of normal production in order to sell the demand of the buyers when made.
>
> In addition to this, the fact that women have turned from wearing worsteds and heavy woolens to lighter fabrics, such as silk and rayon, has deprived woolen and worsted manufacturers of approximately 30 per cent of their market.

Rapid style changes as a factor in increasing costs are stressed thus in another instance:

> There has been a violent change in demand in the last few years; first, from staple fabrics and colors to fancies, and these fancies changing several times in each season; second, in quantity. The customer buys always in small quantities, increasing very materially the cost of production and distribution.

Regarding the importance of this style factor another executive says:

> The most important change that we have noted is the demand of the consumer for the latest up-to-the-minute styles. This makes it necessary for the buyer to purchase from hand to mouth in order to have the latest styles, and also avoid large inventories. In our endeavor to meet this condition, and at the same time continue mass production so as to keep our costs at a minimum, lies probably our greatest problem at the present time.

Sales methods of representative wool manufacturers.—The experiences of individual manufacturers in marketing their products was obtained from a number of leading executives who replied to special inquiries regarding their sales methods. Several of these stated that since their goods were all sold through commission houses they were unable to give any information about the marketing end. A number of others, however, including some of those who sell to commission houses, indicated that close touch is kept with the market. One of these executives states:

> We sell through our selling house, which is practically our sales department. That is, our relations are very close, and we have complete control of our distribution, through the selling house. We sell both to jobbers and to large retailers through about 15 salesmen, and distribute our goods all over the country. The proportion to jobbers is about 40 per cent, while 60 per cent goes to retail stores. In all but one case the territories are arranged geographically and as a rule are based on branch offices in some of the larger cities. Here we take what we call the 6-month season, from October to April, and study our entire distribution by yards and by counties. We then set up a budget based on the total number of yards we are able to produce, and assign this yardage, according to the value of each territory, to each salesman.

The statement of another executive is as follows:

> Our goods are sold through a New York commission house which employs a number of salesmen, covering all the markets of the United States where our goods are handled. Salesmen work mostly on a commission basis, which helps to increase sales, and continuous study of the markets is carried on by our selling agents.

The executive of a mill which handles its own selling states as follows:

> This company's product is sold by six salesmen, all of whom are paid a flat salary. The market is studied by being in constant contact with it. No particular method is used in assigning territories. Good work on the part of our salesmen is recognized by rather frequent increase in their compensation.

The executive of another mill describes his sales organization thus:

> This company uses the sales-department plan of selling, a sales manager being located in New York, who has charge of the entire selling organization at the present time. We have approximately 10 salesmen covering New York and the principal cities of the country. Compensation of these salesmen is on a commission basis. In the case of the salesmen located in the New York markets a drawing account of a reasonable amount is allowed.

The experience of another mill which deals directly with the trade is given thus by its executive:

> We sell our own goods directly to jobbers and manufacturers of garments, the larger part of our product being sold through the mail by sending out complete lines of samples to the entire trade at the beginning of the season. We employ only three salesmen and these travel very little. They are all on a salary basis. The customary method of buying in our trade is to get samples from all sources of supply and compare them and then send in the order, usually by mail. The initial orders are now invariably small, oftentimes only one piece. The manufacturer or jobber then shows the customers what he has, and if he makes sales he then orders the goods. An individual customer may order many times in one season on the same goods, where formerly he would purchase only his individual order and perhaps one repeat order. The manufacturer of garments is much closer in delivering to his customer nowadays than he formerly was, this being due to the final buyer's unwillingness to purchase before he actually needs the goods. The expense of doing business has increased materially because of this fact.

A manufacturer of yarn who deals directly with the trade states as follows:

> We sell our yarn direct to the weaver. We do not employ any salesmen. Our customers, we feel, derive the advantage by our own selling of our products, as we do not have the expense of salesmen. This, we feel, has helped us to sell more goods, giving our customers the lowest price possible.

REWORKED WOOL

Reworked wool, which is commonly known as shoddy, came into extensive use during the Civil War. At the present time the United States produces a total of about 100,000,000 pounds a year, which is equal to one-fourth of the annual wool clip of the United States.

CONDITIONS REPORTED

Number, size, and activity of plants.—Of 68 establishments in the whole United States engaged in the recovery of wool fiber from rags, waste, tailors' clippings, and other sources, with a total product valued in 1925 at $21,000,000, 36 establishments in Massachusetts, Connecticut, and Rhode Island produced about one-fourth. These plants engaged the activities of 774 persons, of whom 662 were wage earners, who received $842,000 in wages and produced goods valued at $5,216,000. Materials used by the industry of these States cost $3,474,000, and the industry's contribution to their income, as shown by value added, was $1,743,000. The value of product for Massachusetts, with 26 establishments, was $3,382,000; for Connecticut, with 4 establishments, $1,603,000; and for the 6 establishments of Rhode Island, $203,000. In addition to the 36 New England establishments enumerated by the census, there were 2 establishments in Maine and 2 in Vermont, with no figures on production. One establishment in the latter State had a larger volume of sales in 1925 than any one for which census figures were given.

Outside the 40 establishments in New England there were 32 plants in other States. The principal other producing States are New York, with 10 establishments and a product valued at upward of $4.000,000; Pennsylvania, with 9 establishments and a product of over $3,000,000; and Ohio, with 3 establishments and a product of somewhat less than $3,000,000.

On account of the shortage of available wool during the World War there was a great increase in the number of mills engaged in reworking wool, there being 78 such establishments in the United States in 1919. The number of these mills in New England increased during the war period—from 28 in 1914 to 45 in 1919. The number fell off to 31 in 1921 and increased after 1923 to 40 in 1925. The New England product in 1919 represented nearly one-half the total for the United States.

On account of incomplete figures it is difficult to determine the present importance in New England of this branch of the wool industry, but it is estimated that in 1925 New England produced between 30 and 40 per cent of the United States total. The national output had a value in 1919 of $23,254,000; in 1923 it was $16,698,000, and in 1925 it was $21,022,000.

The following table shows the importance of this industry in the individual States in 1927 and 1925.

WOOL SHODDY MANUFACTURE IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	3	153	175	880	1, 200	320
1925	4	147	172	1, 275	1, 604	329
Massachusetts:						
1927	24	492	607	1, 581	2, 901	1, 320
1925	26	480	628	2, 076	3, 382	1, 307
Rhode Island:						
1927	3	22	33	124	197	73
1925	6	35	42	123	230	107
Total:						
1927	30	667	815	2, 585	4, 298	1, 713
1925	36	662	842	3, 474	5, 216	1, 743

Source: U. S. Bureau of the Census.

Replies to special inquiries were received from 10 manufacturers in this line, with sales figures from 8 of them, located in Massachusetts, Connecticut, and Vermont, representing a total of 506 employees and aggregate sales in 1925 of $3,789,000. One of these companies had upward of 250 employees and sales exceeding $2,000,000. The other seven companies ranged in size from 12 to 50 employees, and had sales of less than $100,000 to $400,000 each.

All the plants had been established within the last 60 years and none of them within 25 years, the average age being about 40 years. Two of the establishments had changed management within 4 years and one within 12 years. Two of them reported branch plants in New England.

Raw materials.—The principal raw materials reported are woolen rags, wool waste, and clippings, and certain oils and chemicals used in processing the wool fiber. Most of these materials are obtained from sources within New England, but clippings and waste are purchased outside also. The output in 1925 of individual plants ranged from 50 to 90 per cent of full capacity, with an average amounting to 69 per cent. Employees in this line are generally paid on an hour or day basis, and the use of incentive methods of payment is very slight, very few factory workers being paid by piecework.

Sales and marketing.—The principal market for reworked wool reported by these manufacturers is found within New England, all but one of them stating that they sell all their products, or nearly all, in those States. One manufacturer sold one-half of his product within New England and the other half direct to factories all over the country.

Most of the reporting companies use a trade-mark on all or most of their products, but comparatively little advertising is done by them. The product was marketed in every reported case directly to the consuming manufacturer, without the use of selling agency or other intermediaries.

Trend of sales.—Sales of the reporting companies for 1921 to 1925 showed a very pronounced increase, in several cases being from three to five times the amount of 1921. From 1923 to 1925 there was a slight net increase in the total for these 8 companies, 2 of them falling back considerably and the others advancing or holding their own. Most of the falling off took place in 1924. From 1924 to 1925, however, 6 of the companies showed a falling off and only 2 of them showed an increase.

The reasons ascribed by individual manufacturers for declining sales were generally the decreased consumption of woolen goods or foreign competition. One concern stated that it was due to the increased amount of silk in all fabrics, and another stated that the competition from the Western States affects New England customers. One manufacturer stated that despite a greatly decreased demand for his products he had effected considerable reduction in unit costs both in labor and in overhead; another spoke of better results from strict cost accounting and a skilled purchasing department, while a third has increased his sales by putting out a better product.

WOOL SCOURING

The processes of sorting, scouring, and carbonizing wool are carried on, as a rule, in connection with mills which manufacture raw wool into yarn or cloth, and hence this industry, for the most part, is included with other operations of wool manufacturing. There are certain establishments, however, which operate separately, confining themselves wholly to the preparation of raw wool for manufacture. Many of these do this work on commission under regular or special contract, and hence it is difficult to place a value upon their output.

There were 25 of these separate establishments in the United States in 1925, as reported by the census, giving employment to 1,112 wage earners. Fourteen of these establishments were located in New England, and of this number 12 were in Massachusetts. These employed 544 wage earners and paid wages of $822,000, making a product valued at $2,398,000 and adding $1,518,000 to the State income from manufacturing. The same number of establishments was reported for 1927, with a slight increase in wage earners and wages, and a slight reduction in value of output, and in the State revenue from this source. Massachusetts in 1925 contributed 41 per cent of the total reported for separate establishments in the United States. There was one establishment in Connecticut and one in Rhode Island for which no figures were given.

Of 11 establishments which replied to a special inquiry, 7 employed fewer than 50 persons each, 1 between 50 and 100, and 3 between 100 and 500 persons. The output of all of these concerns was disposed of to other manufacturers in New England, distribution being made through commission agents and wool brokers. The principal materials used in processing were reported as sulphuric acid, alkali, and soap, and these were purchased for the most part in New England.

WOOL CARPETS AND RUGS

The making of wool carpets and rugs in New England is confined to Massachusetts and Connecticut. These two States produced in 1925 between one-fourth and one-fifth of the national total. One of the largest manufacturers of wool carpets and rugs in the entire country has its headquarters and main plant in Connecticut, with a branch in Massachusetts, and there is another very large establishment in Massachusetts. These two concerns account for a high percentage of the total New England production. It is estimated that between 7,500 and 8,000 persons, including office and wage earners, are engaged in the manufacture of wool carpets and rugs in the two States.

Importance of the industry.—Massachusetts is the only State for which separate figures are available. The product of Massachusetts in 1925 represented one-eighth of the total value for the United States, and the income from this activity was about one-seventh of the national total. The manufacture of carpets and rugs in Massachusetts is thus of substantial national importance. The product of the nine establishments in this State had a value in 1925 of $23,883,000 and contributed nearly $12,000,000 to the State's income from manufacturing. There were about 4,800 persons engaged in this industry, which paid nearly $5,000,000 in wages provided a market for materials of various sorts amounting to $12,427,000.

In 1927 there were 10 carpet and rug establishments in Massachusetts whose reported output had a value of $22,680,000, contributing more than $12,000,000 to the State's revenue and paying $5,613,000 in wages.

There were 632 looms used in carpet manufacture and 697 rug looms in Massachusetts in 1925, while in the State of Connecticut 859 carpet looms were reported by the census. Most of this machinery was employed in making Wilton and Axminster carpets and rugs.

Massachusetts has more than maintained its position in the national output since the war. The value of the product of this State shows an increase of 80 per cent from 1919 to 1923, in comparison with a national increase outside of Massachusetts of only 60 per cent. There was a slight falling off from 1923 to 1925, amounting in Massachusetts to 2.2 per cent, in contrast with a reduction of 5.7 per cent for the rest of the country. From 1925 to 1927 the value of products for the United States as a whole showed a falling off from $188,903,000 to $164,709,000, a reduction of 12.8 per cent; while the value added by manufacture fell off from $84,707,000 in 1925 to $80,674,000 in 1927, representing a national reduction in income from this source of 5.5 per cent.

The position of carpet and rug manufacture in Massachusetts is shown for the census years from 1904 to 1925 in the following table:

Carpet and Rug Manufacture in Massachusetts, 1904–1927

Year	Establishments		Persons engaged		Salaries in thousands of dollars	
	Massachusetts	United States outside Massachusetts	Massachusetts	United States outside Massachusetts	Massachusetts	United States outside Massachusetts
1927	10	55				
1925	9	60	4,798	31,022	5,668	43,522
1923	11	68	5,264	31,661	7,337	47,136
1921	11	61	3,281	20,781	4,295	27,564
1919	10	65	3,365	20,886	3,886	25,080
1914	12	85	5,641	27,460	2,891	14,698
1909	11	128	6,251	28,455	3,229	14,516
1904	10	129	5,267	29,126	2,329	12,792

Year	Cost of materials in thousands of dollars		Value of products			Value added by manufacture		
			Thousands of dollars		Massachusetts as per cent of United States	Thousands of dollars		Massachusetts as per cent of United States
	Massachusetts	United States outside Massachusetts	Massachusetts	United States outside Massachusetts		Massachusetts	United States outside Massachusetts	
1927	10,638	74,964	22,680	144,208	15.7	12,042	69,244	17.4
1925	12,027	92,169	23,883	165,020	12.6	11,856	72,851	14.0
1923	11,366	86,107	24,420	175,061	12.2	13,055	88,953	12.8
1921	5,878	44,240	11,288	92,593	10.9	5,410	48,352	10.1
1919	8,021	59,097	13,594	109,660	11.0	5,573	50,563	9.9
1914	6,668	35,612	10,981	58,147	15.9	4,313	22,535	16.1
1909	7,501	32,062	12,812	58,376	18.0	5,311	26,314	16.8
1904	6,703	31,245	9,714	51,872	15.8	3,011	20,627	12.7

From replies of a number of these companies to a special inquiry, it is indicated that the majority of their sales are made outside New England, all but one stating that they sell their products nationally. With the exception of one company, the products of all reporting concerns are fully trade-marked. The marketing channels indicated are principally through direct sales to retailers, with a minor portion of the product sold to the wholesale trade. Extensive advertising, in which magazines are the chief medium, was reported by each of the larger companies.

The problems confronting manufacturers in this line are summed up in the following statement from the executive of a large New England concern making woolen rugs:

> There have been many changes during these last few years in consumer demand and in buying policy. Of course, the most outstanding factor has been the hand-to-mouth buying which industries everywhere report. Instead of manufacturing on orders received at one time several months ahead, we are manufacturing almost entirely for stock to meet expected orders. We do not believe that even yet the department stores of the country have reached the limit in close buying. Improvement in transportation and handling of their own stocks and the increase in manufacturers' stocks have made it possible for them to continue their policy of short buying.
>
> There has also been considerable change in consumer demand from the standpoint of style. Whereas for many years rug patterns and colorings changed very slowly and were all based on the oriental rugs, there is now a much quicker change and the demand for more decorative fabrics. * * * Finally, there has been a great change peculiar to our own industry, in that the greater proportion of rugs (up to a few years ago) were seamed—that is, made of strips of carpet—while demand now is almost entirely for a rug without seams, except in the Wilton and even here a change has now taken place through the development of wide looms.

WOOL AND HAIR FELT GOODS

Although the felt-manufacturing industry is relatively small in comparison with the major industries of New England and in comparison with the woven-wool industry, this section holds an important position in the country's total felt manufacture. Massachusetts and Connecticut together contributed about 27 per cent of the national production of wool or hair felt in 1925. The products of this industry are felt cloth and trimming and lining felt, the chief uses of which are for making slippers, for lining boots and shoes, for upholstery, automobile parts, saddle pads, polishing wheels, and piano felts.

CONDITIONS REPORTED

Distribution of industry.—Each of the New England States except Vermont is represented in this industry. Massachusetts overshadows the others with 14 establishments and a product valued in 1925 at $8,687,000, while Connecticut, with 4 establishments, had a product valued at $3,251,000. Maine, New Hampshire, and Rhode Island each had two establishments, for which no figures are available. The 18 establishments in Massachusetts and Connecticut engaged 1,369 persons, of whom 1,229 were wage earners, receiving in wages $1,506,000 and making products valued at $11,938,000. Materials used in the production of these two States cost $7,470,000, and the industry contributed to their income $4,469,000, as indicated by the value added by manufacture. Besides these there were two establishments in Massachusetts reporting the manufacture of wool-felt hats, not included in these figures. In 1927 there were 17 establishments reported in these two States—13 in Massachusetts and 4 in Connecticut—with 1,249 wage earners, who received $1,559,000 in wages. Products of these plants were valued at $10,653,000 and contributed $3,974,000 to the manufacturing revenue.

Size and age of establishments.—Special replies received from 5 companies—3 in Massachusetts and 2 in Connecticut—represented a total employment of 444 persons, and sales in 1925 aggregated $3,284,000. One of these companies had sales under $100,000, 2 of them between $250,000 and $500,000, 1 in excess of $750,000, and 1 of them over $1,000,000. One company employed fewer than 25 persons, 2 others between 50 and 100 persons, and the 2 largest between 100 and 200 persons each. The reported sales were 27.5 per cent of the total value of products for Massachusetts and Connecticut reported by the census, and the employees were 36 per cent of the number reported for these two States in 1925. One of the companies had been established over 50 years, one 75 years, and the largest one over 100 years. No changes in management were indicated within the last 15 years. The largest company reporting has three branch plants—2 in a neighboring State outside New England, established in 1910, and 1 in the Middle West, established in 1923.

Raw materials.—The principal materials mentioned were wool and wool waste, noils, shoddy, cotton, and hair. These were obtained, for the most part, within New England from local sources. The accessibility of raw materials, together with labor conditions and a near-by market for products, were stated as the principal influences determining location in New England.

Sales trend and marketing practice.—The market for the products of these felt manufacturers appears widely distributed—New York City and the Middle Atlantic States, Chicago and the Middle West, and the South being indicated by the individual companies. Sales in New England ranged among these from 10 to 70 per cent. The largest company, reporting sales of $1,500,000, sells only 10 per cent of its products in New England, while another, with sales of $750,000, reported 12½ per cent of its sales in New England, but the percentage is increasing as a result of more intensive sales efforts. A Connecticut manufacturer of hair and wool felt reports 70 per cent of his sales in New England, and states that a change in products has brought about an increase in these local sales. Another, which sells 60 per cent in New England, reported a decrease due to changes in styles.

The aggregate sales of these five companies in 1925 showed an increase of 60 per cent over those of 1921. One company doubled its sales, and each one increased during this 5-year interval. There was a pronounced increase from 1921 to 1923, followed by sharp recession in 1924 and a slight increase in the following year. The three largest companies reported 1925 operations at three-fourths of full capacity, one of the others at only one-third of capacity, while the smallest was operating at one-half capacity.

The prevailing method of marketing is direct to the manufacturing consumer, but three concerns market a portion of their product through wholesalers or jobbers. Two of the companies indicated the use of advertising. Two companies, including the largest, stated that all of their products were trade-marked. A concern whose sales had a marked falling off in 1925 used no trade-marks on its products, while the two other concerns did not reply to this question.

SILK MANUFACTURES

The importance of silk manufacture to New England is indicated by an addition to the manufacturing income of that region in 1925 of nearly $55,000,000 and a distribution in salaries and wages of more than $30,000,000 to some 24,000 persons who were engaged in its activities. There were more than 100 establishments in five of the New England States, and all but 4 of these were in Connecticut, Massachusetts, and Rhode Island. Their output had a value of nearly $132,000,000.

The industry in New England contributed in 1925 approximately 17 per cent of the total national income from silk manufactures and 16.3 per cent of the national value of silk products. This region is surpassed by the State of Pennsylvania, with 40 per cent of the national value, and by New Jersey with 24 per cent, while New York State contributed 14 per cent of the national total.

Connecticut, with a revenue of nearly $25,000,000 from silk manufacturing, is the leading State in New England in that industry. In Massachusetts the industry contributed over $15,000,000 to the State income, and in Rhode Island more than $13,000,000. Its relative importance is greatest in Rhode Island, representing not far from 5 per cent of the total revenue from manufacturing in that State, in contrast with less than 4 per cent in Connecticut and less than 1 per cent in Massachusetts.

The importance of silk manufactures in the individual States is shown in the following table:

New England Silk Manufactures, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	35	9, 183	11, 401	25, 417	47, 498	22, 082
1925	40	9, 977	11, 948	30, 900	55, 601	24, 700
Massachusetts:						
1927	33	7, 357	7, 616	23, 219	38, 220	15, 001
1925	27	6, 497	6, 840	21, 513	36, 608	15, 095
Rhode Island:						
1927	31	6, 500	7, 853	20, 698	32, 511	11, 813
1925	32	6, 087	7, 521	21, 671	34, 855	13, 185
Maine and New Hampshire: 1925	4	775	834	2, 774	4, 735	1, 960
Total:						
1927	99	23, 040	26, 870	69, 334	118, 230	48, 896
1925	103	23, 336	27, 143	76, 852	131, 799	54, 941

MATERIALS USED

The various materials used in silk manufacturing, including fuel, power, and other supplies, provided a market in New England amounting to nearly $77,000,000. Analysis of the data for materials used, machinery employed, and quantity and value of product in 1925, 1919, and 1914 shows that this region has advanced both actually and in comparison with the rest of the country, as is indicated in the following table.

PRINCIPAL MATERIALS USED IN NEW ENGLAND SILK INDUSTRIES

Material and State	1925	1919	1914
Raw silk:	*Pounds*	*Pounds*	*Pounds*
Connecticut, Rhode Island, and Massachusetts	4, 949, 712	3, 696, 666	3, 533, 232
United States	35, 187, 590	25, 890, 728	22, 374, 700
Organzine, tram, and hard crêpe twist:			
Connecticut, Rhode Island, and Massachusetts	2, 526, 573	[1] 282, 572	[2] 41, 121
United States	19, 341, 619	6, 125, 490	3, 855, 899
Spun silk:			
Connecticut, Rhode Island, and Massachusetts	1, 968, 657	[3] 2, 217, 512	[3] 1, 375, 087
United States	4, 597, 454	4, 767, 679	3, 209, 309
Rayon:			
Connecticut, Rhode Island, and Massachusetts	1, 318, 632	[1] 267, 062	[2] 404, 087
United States	15, 728, 292	3, 039, 257	1, 902, 974
Cotton yarns:			
Connecticut, Rhode Island, and Massachusetts	4, 905, 870	6, 818, 127	8, 076, 485
United States	15, 390, 174	17, 958, 012	18, 333, 810

[1] Not including Rhode Island.
[2] Not including Massachusetts and Rhode Island.
[3] Not including Massachusetts.

In the outlay for raw materials, comparison of 1925, 1919, and 1914 shows substantial increases in raw silk, spun silk, organzine, and rayon, and corresponding reductions in the outlay for cotton yarns. The changes in these materials in New England run generally parallel to those for the country as a whole.

The increase in the output of the New England silk industry has been mainly in broad silks. These comprised, in 1925, approximately 60 per cent of the total value of silk manufactures in New England, in contrast with 45 per cent in 1923 and 47 per cent in 1921. The yardage of broad silks shows an increase of 74 per cent from 1921 to 1925 in New England, and of 34 per cent from 1923 to 1925; while the value of this yardage shows an increase of 53 per cent from 1921 to 1925, and of 20 per cent from 1923 to 1925.

TREND OF GROWTH

Relatively slight variation in New England's national position is shown from 1890 onward, except for pronounced advances in the period from 1909 to 1914, and from 1914 to 1919. Its maximum was attained in 1923, not only in the number of persons engaged but also in the value of output and in the total income of the region from this source. In that year New England silk manufactures comprised more than 20 per cent of the national total in value added by manufacture; in terms of national value of product, however, the region contributed the greatest proportion in 1914, with 19.3 per cent of the United States total.

ACTIVE LOOMS USED ON BROAD SILKS IN NEW ENGLAND

Year	Connecticut, Rhode Island, and Massachusetts	United States, total
1925	17, 511	103, 433
1923	17, 039	94, 172
1919	13, 432	87, 215
1914	11, 525	73, 504

PRODUCTION OF BROAD SILKS IN NEW ENGLAND

State	1925	1923	1921
Connecticut, Rhode Island, and Massachusetts:			
Pounds	10, 555, 781	7, 857, 455	6, 306, 710
Square yards	76, 802, 381	57, 158, 841	44, 232, 600
Value	$75, 051, 255	$62, 594, 330	$49, 099, 827
United States, value	$529, 121, 011	$456, 082, 819	$341, 056, 757
New England per cent of United States	14. 2	13. 7	14. 4

In the number of establishments the maximum year was 1925. The number in that year showed an increase of 6 plants over 1923 and of 11 over 1921. The greatest increase in number of establishments took place in the interval from 1914 to 1919, during which time there was a net addition of 17 establishments. The fact that in 1925 the number of establishments in New England was only 6.6 of the total for the United States, while this section produced 15.7 per cent of the national value of silk manufactures, shows that the average size of New England plants is much greater than in the rest of the country. This is accounted for by the existence of several large companies in New England and by a relatively large number of small companies in other sections of the country.

SILK MANUFACTURES IN NEW ENGLAND, 1890–1927

Year	Establishments		Persons engaged			Salaries and wages		
						Thousands of dollars		New England as per cent of United States
	New England	United States outside New England	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	
1927	99	1, 549	24, 579	112, 399	17. 9	31, 235	130, 739	19. 2
1925	99	1, 560	23, 980	128, 374	15. 7	30, 199	137, 394	18. 0
1923	93	1, 505	25, 497	111, 788	18. 6	32, 748	121, 980	21. 2
1921	88	1, 477	22, 780	108, 917	17. 3	25, 436	108, 658	19. 0
1919	92	1, 277	22, 656	114, 119	16. 6	25, 785	108, 812	19. 2
1914	75	827	18, 867	96, 704	16. 3	11, 287	46, 328	19. 6
1909	79	773	15, 443	89, 795	14. 7	7, 655	38, 442	16. 6
1904	69	555	12, 880	71, 273	15. 3	5, 429	26, 081	17. 2
1900	64	419	10, 603	57, 947	15. 5	4, 313	19, 804	17. 9
1890	58	414	8, 491	42, 422	16. 7	3, 365	16, 315	17. 1

Silk Manufactures in New England, 1890–1927—Continued

Year	Cost of materials			Value of products			Value added by manufacture		
	Thousands of dollars		New England as per cent of United States	Thousands of dollars		New England as per cent of United States	Thousands of dollars		New England as per cent of United States
	New England	United States outside New England		New England	United States outside New England		New England	United States outside New England	
1927	69, 333	376, 058	15. 6	118, 230	631, 894	15. 8	48, 896	255, 837	16. 0
1925 [1]	74, 084	410, 039	15. 3	127, 064	681, 915	15. 7	52, 980	271, 877	16. 3
1923 [2]	82, 204	396, 834	17. 2	139, 718	621, 604	18. 4	57, 514	224, 770	20. 4
1921 [3]	60, 337	277, 222	17. 9	104, 569	478, 850	17. 9	44, 232	201, 628	18. 0
1919 [3]	73, 584	314, 885	18. 9	129, 467	559, 003	18. 8	55, 882	244, 119	18. 6
1914 [4]	29, 694	114, 748	20. 6	48, 933	205, 078	19. 3	19, 239	90, 330	17. 6
1909 [5]	20, 452	87, 315	19. 0	34, 589	162, 323	17. 6	14, 137	75, 008	15. 9
1904 [4]	14, 951	60, 910	19. 7	25, 192	108, 096	18. 9	10, 241	47, 186	17. 8
1900 [1]	11, 841	50, 566	19. 0	19, 648	87, 608	18. 3	7, 807	37, 042	17. 4
1890 [6]	9, 604	41, 400	18. 8	15, 576	71, 722	17. 8	5, 972	30, 322	16. 5

[1] Excluding 2 establishments in Maine and 2 in New Hampshire.
[2] Excluding 2 establishments in Maine and 3 in New Hampshire.
[3] Excluding 3 establishments in Maine and 2 in New Hampshire.
[4] Excluding 1 establishment in Maine and 2 in New Hampshire.
[5] Excluding 1 establishment in Maine and 1 in New Hampshire.
[6] Excluding 1 establishment in Maine.

EXPERIENCES OF MANUFACTURERS

The following analysis of special replies from silk manufacturers, shows the general condition of the silk industry in New England in the last few years. The views and opinions expressed herein are presented to show the attitude of representative men in this industry, rather than as official statements or conclusions. As the replies represent more than half of the silk industry in New England, this analysis gives a fair picture of conditions prevailing in the period covered.

Answers to inquiries regarding manufacturing and selling practices were received from 36 companies, in which Connecticut was represented with 17 replies, Rhode Island with 9, Massachusetts with 9, and New Hampshire with 1. Four of these companies were engaged only in commission weaving, so they were unable to supply sales figures, while another plant was a branch of a company with headquarters in New Jersey. Complete data regarding volume of business were given by 31 establishments, whose combined sales in 1925 totaled $67,478,000 and represented 51 per cent of the total production of the industry in New England as reported by the census.

PRODUCTS AND MATERIALS

The products made by the reporting establishments are for the most part woven goods, which include mainly broad silk (dress goods, crêpes, linings, velvet, and plushes) and narrow silk (ribbons, trimmings, neckwear, and hatbands). Other reported products include yarns and twists, spun silk, sewing silk, silk thread, braid and cord, and fish lines. Twenty-one of the establishments were engaged in the manufacture of woven products, while 10 of them concentrated on other silk goods and 5 made a combination of both. Two establishments specialized in velvet and plushes, 2 others in hat bands, 2 in silk fishing lines and cord, 3 in silk thread, and 1 in silk yarn. Several of the larger companies included a variety of products—broad silk, twists and yarns, ribbons, cravats, hosiery, and other woven-silk products.

RAW MATERIALS

The principal materials used are raw and spun silk and silk waste, raw cotton, and cotton and worsted yarn. Individual manufacturers report also rayon, jute, linen, spools, and dyeing materials. The use of rayon was reported by 12 of the establishments. Raw silk comes from foreign sources, principally Japan and China, and is purchased principally in New York City, although some of the larger manufacturers import it direct. Spun silk is obtained from within New England or New York and New Jersey, and some of it comes from Italy and France. Worsted yarns are obtained from New England sources and New Jersey. Cotton yarns are purchased both from New England and from southern sources. Rayon is purchased outside of New England, generally from the Middle Atlantic States.

AGE AND SIZE OF ESTABLISHMENTS

That this is one of the long-established industries of New England is indicated by the fact that over half of the companies reporting have been in continuous operation over 25 years and a quarter of them over 50 years. Of the companies doing over $1,000,000 worth of business in 1925, all but two had been in operation more than 25 years and several of the larger ones over half a century. One of the latter was established 88 years ago and has been under the same family management for three generations. Another large company was established in New England over 80 years ago. Sixteen companies had been established within the last 15 years; several of these came into existence between 1914 and 1921 and 5 of them since 1921. It is thus apparent that the industry has expanded considerably within recent years.

Changes of management have been infrequent. In seven instances such changes were indicated within a 15-year period, and three of the changes were since 1921. Few changes in management are noted among the older establishments. No instances were given of a change in the original use of plants, the special machinery and equipment required for silk production apparently accounting for this fact.

A high degree of concentration in large companies is indicated by the replies. Of the total sales reported for 1925 by the 31 companies, nearly 90 per cent was represented by 12 companies, each of which did a business of over $1,000,000. The 3 largest companies accounted for over one-half of the total, and 9 others, whose sales ranged from $1,000,000 to $5,000,000, accounted for one-third more; while 6 companies with a volume between $500,000 and $1,000,000 made up one-sixth of the total, and the remaining 13 firms, with sales of less than $500,000, made up only 4 per cent of the total.

A total average annual employment of 11,500 persons was reported by the 36 companies, and over three-fourths of this number were employed by the 7 largest companies. There were 3 companies, each of which employed over 1,000 persons, and these accounted for 54 per cent of the total number; 4 companies, employing between 500 and 1,000 persons each, accounted for 23 per cent; and 7 companies, employing between 100 and 500 persons, accounted for 14 per cent. The remaining 22 companies, employing less than 100 persons each, had only 9 per cent of the total wage earners reported.

BRANCH PLANTS

Nine of the larger companies reported a total of 20 branch plants. One of these has 8 branches, 5 of which are in New England, 1 in New York State, 1 in the Middle West, and 1 in California. Another company reports 4 branches, all in New England; another has 2 in New England; while 6 others report 1 branch each. Altogether there are 13 branches reported in New England and 7 branches outside of New England. The latter are principally in New Jersey, New York, and Pennsylvania. Two of the reporting companies have their main offices and plants in New Jersey. One of the largest concerns in the entire group has no branches but carries on its entire manufacturing operations in one centralized plant.

PLANT LOCATION AND CAPACITY

Labor conditions and nearness to market are given by the largest number of manufacturers as the chief reasons for their location in New England. This nearness to market refers, in general, not to the New England market but to the New York market, where many of the large wholesalers of silk goods are located within easy access and with good transportation facilities.

Additions to capacity of plants since 1921 were indicated by one-third of the companies reporting, while one-third indicated no increases and the remaining one-third did not reply to this question. One small manufacturer in Rhode Island indicated a 100 per cent increase; another Massachusetts concern doing commission weaving reports 80 per cent increase; while a Rhode Island manufacturer of broad silks doing $500,000 business reports an increase of 75 per cent. One of the three largest manufacturers reports an addition of 65 per cent, while a $2,000,000 concern in Connecticut reports a 40 per cent addition. Increases in capacity from 10 to 30 per cent are reported by six other establishments. In general, the increases reported appear to have been justified by the resulting increases in sales, indicating that the additions have been fully utilized.

Two-thirds of the reports indicate that operations in 1925 were 75 per cent or more of the maximum capacity of their plants. Six of these, including 5 manufacturers of broad silk and 1 of silk yarn, report operating at maximum capacity, and several others were close to it; while 4 other establishments report running at less than one-half of capacity. Naturally, the companies operating at full or nearly full capacity show a more substantial sales increase, but with one or two exceptions the sales figures of concerns running at low capacity do not indicate a pronounced difference from the general trend, or any pronounced falling off in sales since 1923, when compared with the other companies.

EMPLOYMENT CONDITIONS

The seasonal trend of employment, as shown by the experience of the reporting companies, indicates a more uniform employment of labor throughout the year than is shown in many of the other industries of New England. Definite efforts along several lines have contributed materially to this condition, particularly the introduction of supplementary products and manufacturing for stock during slow periods. One concern making fish lines states that manufacturing for southern trade helps sales in the summer, while another states that during dull periods a stock of staples is accumulated whereby fairly uniform employment is insured. Another concern has had a measure of success in its efforts to develop materials used by different trades in order to overcome the seasonal characteristics of the business, while a manufacturer of twists and sewing silks has added the converting of rayon and mixed yarn.

Practically every manufacturer reports the introduction of plans for the control of labor costs in the form of incentive methods of wage payment. For the entire group such plans applied to better than one-half of the workers. Several instances are found in which from 75 to 90 per cent of factory employees are on a basis of payment for piecework or other incentive.

IMPROVEMENTS EFFECTED

Of the outstanding improvements in manufacturing conditions or methods indicated by various manufacturers, the ones most frequently mentioned are improved methods of inspection; prevention of accidents; control of production; control of organization and executive functions; and attention to the maintenance of plant and equipment.

Regarding the results of these internal improvements, one manufacturer states that relations between management and workers have shown outstanding improvement, and another credits better methods of wage payment with a substantial increase in production. Another states that "balancing production capacity with demand has been a great aid in keeping ahead." In another case better organization and executive control is held responsible for balanced production. Another manufacturer has increased production through changes in looms. Executive control and inspection, together with the changing from out-of-date machinery to modern types, are reported by another manufacturer as the outstanding improvements.

The following statements from executives, in reply to a special inquiry regarding their policy toward the installation of new and up-to-date equipment, indicate the attitude of progressive mills in this respect. One manufacturer states as follows:

> The policy of our company in regard to the installation of up-to-date equipment is to install such equipment as has proved itself not only practical but economical. In general, we believe that not only New England but the United States as a whole is more ready to accept new equipment and new methods than foreign countries.

Another manufacturer says:

> The policy of our company in regard to new or up-to-date equipment has been to keep our equipment as near par as possible, adding new equipment wherever new changes have shown themselves. This, we believe, has been the prevailing course pursued by our industry in general in New England.

This sentiment is echoed in another reply:

> We might state that we have the best and most up-to-date machinery you will be able to find in New England—up-to-date in every respect for our purpose of making hatbands for men's hats.

The executive of one of the newer concerns states as follows:

> Being a comparatively young company, we have followed the policy of installing new and the most modern machinery available for our work. Even in the six years which we have been running we have found it necessary, in order to keep abreast of the times, to discard machinery that five years ago was the last word in efficiency, and install new.

Recognition of the importance of proper equipment is given by another manufacturer, in the statement, "We are keeping our plant up-to-date in every particular, having recently added 100 looms of the most modern construction."

The need for careful discrimination is indicated thus by another manufacturer:

> Our product is principally machine twist for the finishing trade, also dyed and gum silk yarn. Throwing machinery has changed but little during the last few years, except for improvements in detail. By buying new machinery we procure the latest type possible, and are regularly bringing our old machinery up to date. This we think is the attitude of the industry in general, as very little of the throwing machinery becomes obsolete.

That silk manufacturers have had to face a difficult situation is indicated in the following statement from another executive:

> It is imperative, if one desires to stay at the top of any industry, to keep in line with the new, improved manufacturing installations. In the silk industry the conditions for the past few years have not been very bright, with the result that one must keep his expenditures for improvement in line with the yearly return. It is our opinion that there are more looms producing silk than there should be at the present time, but this is the condition of all industries, and it will continue for years to come. It is merely a case of the survival of the fittest.

SALES AND MARKETING

The trend of sales made by these 31 companies from 1921 to 1925 was generally upward, with a sharp advance from 1921 to 1923, followed by a decline of about 13 per cent in 1924 and a partial recovery in the following year. Although the total sales for 1925 were much higher than in 1921, they represented a decrease of 6.7 per cent from the total of 1923. The figures for the respective years are $72,344,000 in 1923; $62,829,000 in 1924; and $67,478,000 in 1925.

Only one company showed decreases in sales from 1921 to 1923, and all but three of them showed increases in sales from 1921 to 1925. One of the latter, a medium-sized concern in Massachusetts now making silk and rayon thread, showed a substantial growth in sales through 1923 and then fell back sharply in 1924, when it underwent a change in management. Its present president states, "Our difficulty is increased cost of raw materials and forced reduction in selling prices by large competitors."

A Connecticut manufacturer of dress silk linings, doing a $400,000 business, experienced a sharp decrease in 1922, which was more than made up in the following year, with a greater reduction in 1924. This manufacturer explains this falling off as due to "use of cheaper qualities of goods and increasing use of clothing made by the large manufacturers of New York State and the West."

A large manufacturer of silk velvet, with a business in 1921 of nearly $5,000,000, had a pronounced increase through 1923, followed by a sharp falling off in 1924 and 1925. Hhis product is marketed, without trade-mark, through a commission agent. The dropping off in sales is explained in this instance as the result of "style changes." A parallel experience, in slightly lesser degree, is reported by a manufacturer of millinery and dress velvets and plushes doing a $2,000,000 business, whose product (not trade-marked) is likewise marketed through a commission house. This manufacturer gives as the reason for decreased sales the fact that hat makers are moving to New York City.

For the period from 1923 to 1925 the total sales of 22 companies making woven silk products or a combination of woven and other products, and representing the preponderant portion of the industry reported, showed in 1924 a pronounced decrease—about 14 per cent below the preceding year. Despite a partial recovery in the following year, the sales in 1925 showed a decrease of 7 per cent. On the other hand, the total sales of nine companies making other than woven silk products, representing a volume in 1925 of $3,627,000, showed a slight increase from 1923 to 1924, followed by a substantial increase in 1925, resulting in an average increase of about 23 per cent for the 2-year period. The manufacturers of other silk products thus appear to have fared better than those making woven goods.

Among the whole group of 31 manufacturers, 20 showed decreased sales in 1924, while 11 showed increases. In the following year the situation was reversed, with only 7 firms showing a recession of sales volume in 1925, while 24 showed increases. For the 2-year period 15 companies whose sales in 1925 amounted to $51,000,000 showed an average decrease in sales volume of 15 per cent compared with 1923; while 16 firms with sales in 1925 totaling $16,500,000 showed an average increase of 35 per cent over 1923. Of the 12 companies having sales in 1925 exceeding $1,000,000, all but 4 increased their sales volume over the preceding year. Two of the firms with diminishing sales were manufacturers of velvet. One of the others was a manufacturer of broad silk, with all of its products trade-marked, but doing no advertising and selling its products to retailers through commission agents in New York. The other was a large manufacturer of a varied line of broad silk, velvet, cravats, and thrown and spun silk, selling its trade-marked products nationally to retailers, wholesalers, and manufacturers. Its decrease in sales is charged to "general overproduction and increased competition." The treasurer of this company states, "Important factors in the silk business are management, labor conditions, sales and marketing methods, and sources of raw materials. Exports, transportation, and other factors play a very small part in our business." Where total sales have decreased, the reason given by the greatest number is general overproduction. The companies reporting increased sales state that the chief contributing factor is new sales methods.

New England is a minor market for most of the plants reporting in the silk industry. A manufacturer of silk hatbands in Connecticut doing a $500,000 business sell practically his entire product in New England, while another smaller company making a similar line sells 60 per cent within those States. Two manufacturers of twists, yarns, nubs, and sewing silk, and one concern doing commission throwing, report 75 per cent of their business in New England, while another manufacturer of similar lines reports 50 per cent. Two of these concerns state that New England sales are increasing, and two of them that they are decreasing. The same number of companies stated that sales in New England were increasing as stated that they were decreasing, while three concerns reported that sales were unchanged.

All the manufacturers of broad silk state that only a slight proportion—from 5 to 10 per cent of their sales—are in New England, and several state that none of them are.

The principal market indicated by these manufacturers is in New York, New Jersey, and Pennsylvania, New York City appearing prominently. Five of the larger companies distribute their products nationally, while three other companies indicate important markets in the Middle West. A manufacturer of silk fishing lines reports a considerable portion of his market in the Southern States. Competition most frequently mentioned is that from the Middle Atlantic States, in which most of the market is located. Only a small number stress competition from within New England.

Only four companies report any direct exports. Two of these are small manufacturers of silk fishing lines, cord, and thread, reporting 1 and 5 per cent, respectively. A Connecticut manufacturer of silk thread doing a $1,000,000 business reports exports of 5 per cent of the total, while another concern in the same State engaged in making threads and other silk fabrics doing a business of upward of $5,000,000, reports exports of 16⅔ per cent.

USE OF TRADE-MARKS AND ADVERTISING

Most of the concerns indicating their practice in regard to the use of trade-marks reported that all or a major part of their products are marketed under a brand name; while 4 others brand a small portion of their products, and 6 reported the use of no trade-marks at all.

Twenty-one companies indicated their practice regarding the use of advertising, while 14 ignored this question. Nine of the companies report the use of national advertising mediums, principally magazines and trade journals, supplemented by direct mail, and in one case by newspapers. Twelve concerns report no advertising. Advertising expenditures in 1925 for the entire group amounted to 2 per cent of the total value of sales.

METHODS OF DISTRIBUTION

The marketing of silk goods is effected primarily through wholesale channels, with the retailer secondary in importance. Ten manufacturers reported the marketing of their products entirely through wholesalers, and 15 used this channel in addition to others. Sales direct to retailers were reported in 13 instances but always in conjunction with other channels, chiefly wholesalers, no manufacturer depending solely upon distribution through retailers. A manufacturer of hatbands, linings, and related products sells his entire output direct to the consuming hat manufacturers. A maker of twists, sewing threads, and yarns sells direct to the consumer, who in this case is the manufacturer; another maker of the same line of products has his own selling organization. Only two manufacturers (making braid and thread) reported a portion of their sales made direct by mail.

The experiences of a few representative manufacturers of silk goods, obtained by special inquiry, are presented to show the general sales plans and selling methods in use by some of the outstanding companies.

One executive states, "Our general sales plan is the personal touch of our salesmen with the buyer connected with the industry. We have seven salesmen covering the entire United States and Canada."

The sales plan of another company is stated thus:

> We try to sell a product, identified by our name, through the advertising efforts of salesmen. The number of salesmen in the territory covered by them is determined in part by the character of the business, the length of the jumps, and the number of customers and sales to be made. Salesmen are compensated upon a point system which takes into account the efforts necessary to make a sale and the profits to be obtained from it. The market is studied through reports of salesmen and statistical information obtained from trade associations and the trade press.

Another manufacturer states, "Our usual plan with our salesmen is a commission basis, striving to make the territory as productive as possible in the interest of both seller and manufacturer."

The selling organization of one of the largest silk manufacturers is described thus by its chief executive:

> Our sales are conducted through branch offices located in primary market points—New York, Boston, Philadelphia, Baltimore, Chicago, Cincinnati, St. Louis, St. Paul, and San Francisco. Each office is an independent unit, subject only to the general policies of the corporation office. Each office has its own corps of salesmen, carries stock, distributes the merchandise, and makes collections. All together we have 150 salesmen. They are compensated entirely upon a commission plan, the commission being paid on net sales at the end of each month. Territories are assigned by each branch manager and are arranged as nearly as possible to balance territories and centralize the territory of each salesman.

The executive of a concern whose market is chiefly local states: "Our business is localized to a great extent, and we have very few salesmen." Another states: "On account of the small size of the concern, our selling force consists of one general salesman and officer of the company. A large percentage of our business is done either by mail or telephone direct to the office."

NEW CONDITIONS

In common with other branches of the textile industry, the silk manufacturers of New England have had to meet new conditions of production and of marketing that have required considerable adjustment on their part. These problems have not been confined to New England, but have faced the industry as a whole. The outstanding new situation in this industry is that arising from the development and use of rayon. Whereas the earlier attitude toward this new fabric was one of rivalry and competition, rayon has come to be looked upon more and more as a supplementary asset in the silk industry. Minor changes in manufacturing processes have been necessary for the most part.

In regard to conditions of manufacture the executive of a large silk plant writes as follows:

> In the consumption of machine twist for stitching the demand changes but little, excepting that the tendency is running to finer sizes and the usual changes of colors depending on the seasons. In the hosiery business where a gum silk is sold largely by us, the demand is changing from circular knit to full-fashioned, requiring an entirely different construction and quality of yarn, but which can be made on the same machinery. Many of our customers using dyed yarn, also silk wound on cops for weaving, have changed from silk to rayon. With minor changes of equipment, these yarns are run on the same machinery formerly used for the real silk.

The significant changes that have taken place within the last few years in the marketing of silk products are reflected in the following quotations from executives of important companies in this industry. These statements indicate the new marketing conditions that have to be dealt with. One executive states:

> Some years back there used to be a distinct line between the manufacturer and the jobber. The manufacturer used to make goods for the jobber, who would anticipate his needs, and the jobber bore the burden of carrying large assortments from which the small dealer could supply his wants. The market has now changed. The manufacturer with the selling organization is now both manufacturer and jobber, as competition has forced business to recognize but one small profit. In fact, the condition of the silk-weaving industry is such that the leading concerns will have to own their own dyeing plant and their own throwing plant in order to be on a competitive basis, and to make one profit for the entire operation. This requires a tremendous investment, and, in so far as the profits are not in proportion to the risk taken, there will be naturally a tendency to discourage further investment in the silk field. Probably in this manner conditions will right themselves again after a period of years.

This attitude is reflected in the statement of another executive:

> There has taken place very marked changes in what is known as hand-to-mouth buying, which in general means that the distributors are buying much closer to the demands of the market than they have done in the past. As a result the manufacturers have to carry a larger portion of the responsibility for stock than they have done in the past; it is possible that the total stock of the new system is less than it has been heretofore, but unquestionably the burden on the manufacturer is greater.

Another manufacturer states: "As our production goes entirely to woolen and worsted mills, the so-called hand-to-mouth buying by industry has necessitated our carrying large quantities of our products ready for immediate shipment."

The following statement of an executive refers to the increasing concentration in the silk industry: "The changes that have taken place during the last five years from the standpoint of marketing are that we have less than one-quarter of our former customers but are doing a much larger business, showing more concentration in the industry."

The difficulties of the marketing situation are thus expressed by the executive of another company: "The most difficult marketing problems to-day arise from lack of knowledge of future requirements and lack of future delivery orders, also uncertainty of size requirements and quality, which all tend to bring the business in the main to a spot delivery basis."

That the New England manufacturers of silk goods are generally alert to the need for special attention to the marketing and selling of their products is indicated by the fact that a substantial majority of concerns stated that they are concentrating effort upon these phases of their business.

KNIT GOODS

Although the income from separate knit-goods establishments in New England comprises only a small fraction (1.1 per cent) of the region's total revenue from all its manufactures, yet the substantial importance of this textile line is apparent from the fact that in 1925 it contributed upward of $33,000,000 to the New England income and engaged the activities of more than 19,000 persons, who were paid some $20,000,000 in salaries and wages. The value of the product exceeded $79,000,000, representing slightly less than 10 per cent of the national total. These figures include only the data for establishments engaged primarily in making knit goods and do not include the knit goods made as secondary products in other textile plants. They include knitted fabrics made of cotton, wool, silk, rayon, and their mixtures.

The principal producing regions of knit goods lie outside New England—in Pennsylvania and New York. These two States produce more than half the United States total, and each one of them produces more than twice the production of all New England. Other important producing States are Wisconsin, Tennessee, North Carolina, and New Jersey, in the order given, contributing together about 22 per cent of the national output.

Massachusetts had in 1925 more than half of the 159 knit-goods establishments of New England and contributed 62 per cent of the region's revenue from this source, amounting in this State to more than $20,000,000. Rhode Island and New Hampshire are of approximately equal importance in this line, these two States together contributing $7,700,000 to the New England revenue from this source and representing 23 per cent of the region's total; Connecticut contributed 8 per cent, and Vermont not quite 7 per cent.

IMPORTANCE IN INDIVIDUAL STATES

The importance of the knit-goods industry to the individual States is greatest in Vermont and New Hampshire and least in

Connecticut. In Vermont this industry represented 3.6 per cent of the State's total manufacturing income and in New Hampshire 2.7 per cent, while in Connecticut it was less than one-half of 1 per cent. In Massachusetts and Rhode Island it was of approximately similar importance, representing 1.3 per cent in the former State and 1.4 per cent in the latter. The position of the individual States in the New England total is shown in the following table.

Knit Goods Industry in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	93	9, 660	9, 339	22, 316	43, 937	21, 621
1925	88	10, 551	9, 715	25, 903	46, 387	20, 484
Rhode Island:						
1927	21	1, 636	1, 783	6, 429	10, 724	4, 296
1925	23	1, 821	1, 899	6, 607	10, 605	3, 999
New Hampshire:						
1927	16	2, 032	1, 785	4, 083	7, 093	3, 010
1925	17	2, 444	2, 078	6, 089	9, 790	3, 701
Connecticut:						
1927	15	1, 367	1, 421	2, 319	5, 181	2, 862
1925	21	1, 657	1, 661	4, 082	6, 741	2, 659
Vermont:						
1927	7	1, 184	1, 103	2, 425	5, 160	2, 735
1925	8	1, 257	1, 088	332	5, 639	2, 307
Maine:						
1927	3	18	13	47	90	43
Total:						
1927	155	15, 897	15, 444	37, 618	72, 186	34, 568
1925	157	27, 730	17, 730	46, 013	79, 162	33, 150

PRINCIPAL MATERIALS USED

As a market for various materials used in manufacture, the importance of the knit-goods industry in New England is indicated by an outlay in 1925 of more than $45,000,000. This was used in the purchase of raw materials and in expenditures for fuel, power, and mill supplies. The chief material purchased is yarns, principally of cotton, and also woolen, worsted, and rayon. Although most of this industry uses yarns purchased from other establishments, some raw cotton, wool, and other materials are purchased. The volume of the principal items that were purchased in 1925, 1919, and 1914 is shown in the next table, in so far as data are available for separate States. Comparison of these years shows substantial increases since 1914 in the consumption of cotton yarn, also of woolen, worsted, marino, and silk yarns, as well as in the use of cotton waste. Sharp reductions are noted in the consumption of raw cotton and raw wool, also of recovered wool fabric and wool waste.

MATERIALS USED IN NEW ENGLAND KNIT-GOODS INDUSTRY

Material and State	Thousands of pounds		
	1925	1919	1914
Cotton yarn, not mercerized:			
Connecticut, Massachsuetts, New Hampshire, Rhode Island, and Vermont	15, 153	18, 941	[1] 10, 319
Cotton yarn, mercerized:			
Connecticut, Massachusetts, and Rhode Island	2, 009	1, 862	1, 260
United States total	67, 044	30, 519	15, 673
Woolen yarn:			
Massachusetts	1, 466	375	123
United States total	10, 353	5, 384	7, 145
Worsted yarn:			
Connecticut, Massachusetts, New Hampshire, and Rhode Island	4, 469	2, 480	3, 046
United States total	24, 546	12, 636	14, 305
Merino yarn:			
Connecticut, Massachusetts, and Rhode Island	1, 111	1, 025	735
United States total	10, 090	6, 965	4, 333
Silk yarn and spun-silk yarn:			
Connecticut, Massachusetts, and Rhode Island	339	284	292
United States total	8, 790	5, 711	1, 913
Raw cotton:			
Connecticut, Massachusetts, and New Hampshire	4, 213	18, 688	17, 462
United States total	66, 068	93, 050	88, 390
Cotton waste:			
Connecticut, Massachusetts, and New Hampshire	2, 134	2, 032	1, 147
United States, total	21, 250	24, 832	24, 304
Wool, in condition in which purchased:			
Connecticut, Massachusetts, and New Hampshire	539	1, 259	1, 576
United States, total	6, 223	4, 518	6, 948
Wool, equivalent to above in scoured condition:			
Connecticut, Massachusetts, and New Hampshire	369	1, 155	1, 421
United States, total	4, 213	4, 116	6, 072
Recovered wool fiber:			
New Hampshire	165	600	609
United States, total	3, 415	5, 367	3, 454
Wool waste and noils:			
Connecticut	348	827	812
United States, total	9, 984	5, 026	5, 946

[1] Exclusive of New Hampshire and Vermont.

NOTE.—This incomplete table includes only data for the States for which separate statistics are available.

The amount of rayon consumed by the knit-goods industry is not segregated for New England. For the United States as a whole the consumption in 1925 was reported as 23,680,000 pounds, of which nearly one-half was used in making hosiery.

NATURE OF PRODUCTS

The knit-goods industry has four recognized branches, according to the nature of its products. In New England the principal products are underwear and hosiery, and the importance of each of these as a source of income is approximately the same. Of lesser significance is the making of outerwear and of knitted cloth, each of which contributes about the same proportion. The greatest number of establishments, however, is engaged in making outerwear. Of the New England total of 56 in this line there were 39 concerns in Massachusetts and 9 in Connecticut. There were 48 establishments making hosiery, which were fairly well distributed in the different States. There were 36 establishments engaged in making underwear; 20 of these were in Massachusetts, and the rest were distributed in the other five States. The manufacture of knitted cloth was reported by 19 concerns in Massachusetts, Rhode Island, and Connecticut.

In terms of the relative position of New England in the national production of these individual lines, knitted cloth leads. The value of this product in Massachusetts and Rhode Island was 20.8 per cent of the national total. The underwear produced in Massachusetts, Connecticut, and Vermont comprised 14 per cent of the value of the national production. Hosiery produced in Massachusetts, New Hampshire, Rhode Island, and Vermont amounted to 6.6 per cent, and the outerwear reported for Massachusetts and Connecticut was 5.7 per cent of the national total.

The importance of each of these four branches of knit-goods manufacture in each State for which separate data are available for 1925 is shown in the following table.

DISTRIBUTION OF KNIT-GOODS INDUSTRY, BY STATES, IN 1925

Branches of industry and State	Establishments	Thousands of dollars	
		Value of products	Value added by manufacture
Hosiery (48 establishments):			
Massachusetts	18	15, 802	6, 738
New Hampshire	13	7, 905	3, 135
Rhode Island	10	3, 365	1, 704
Vermont	3	622	242
Total, 4 States [1]	44	27, 694	11, 819
United States total	683	421, 180	193, 038
Underwear (36 establishments):			
Massachusetts	20	15, 733	7, 866
Connecticut	7	5, 577	2, 262
Vermont	5	5, 016	2, 065
Total, 3 States [2]	32	26, 327	12, 193
United States total	298	188, 570	77, 797
Outerwear (56 establishments):			
Massachusetts	39	7, 777	3, 326
Connecticut	9	459	175
Total, 2 States [3]	48	8, 236	3, 501
United States total	874	143, 502	65, 954
Knit cloth (19 establishments):			
Massachusetts	11	7, 073	2, 554
Rhode Island	7	4, 689	1, 345
Total, 2 States [4]	18	11, 762	3, 899
United States total	132	56, 708	19, 245

[1] Connecticut has 4 establishments.
[2] New Hampshire and Rhode Island each has 2 establishments.
[3] Maine has 2, New Hampshire 2, and Rhode Island 4 establishments.
[4] Connecticut has 1 establishment.

TREND OF MANUFACTURE

In New England the knit goods industry showed a gradual but continuous growth up to the end of the World War. There has been no wide variation in the number of persons engaged since 1909, except in the maximum year 1919 and again in 1923, when the number was 1,500 less than in 1919. In the year of greatest output (1919) the number of establishments was 12 less than in 1914. The total number in 1923 was the same as in 1914, and in 1925 the number of establishments was four less than in 1923.

Comparison of figures for various census years shows a much greater expansion of this industry in the States outside New England than within the region. A gradual and continuous recession is thus noted in New England's relative national position. In 1880 New England contributed 27 per cent of the value of the total knit-goods output of the United States, in 1900 less than 19 per cent, in 1914 less than 13 per cent, and in 1925 less than 10 per cent.

In the 10-year period from 1904 to 1914 the New England income from knit-goods manufacture increased 34 per cent; but in this period the increase for the country as a whole was 87 per cent. The increase in New England income from 1914 to 1925 was 118 per cent, while the national increase from this industry was 217 per cent.

The New England revenue from the knit-goods industry in 1923 was only $500,000 below the 1919 maximum of $35,649,000, but for the United States as a whole there was an increase of $78,000,000 in this interval. The New England income in 1925 showed a falling off from 1923 of somewhat over $2,000,000, a reduction of about 6 per cent; for the country as a whole there was a falling off in 1925 of $8,000,000, a reduction of 2.3 per cent.

In the next table is shown, for New England and for the rest of the country outside New England, the importance of knit-goods manufacture in each census year from 1880 to 1925.

NEW ENGLAND KNIT-GOODS INDUSTRY, 1880–1927, COMPARED WITH REST OF UNITED STATES

Year	Establishments		Persons engaged			Salaries and wages		
						Thousands of dollars		
	New England	United States outside New England	New England	United States outside New England	New England as per cent of United States	New England	United States outside New England	New England as per cent of United States
1927	155	(1)	(1)	(1)	(1)	(1)	(1)	(1)
1925 [2]	157	1,830	19,191	182,912	9.5	19,994	184,182	9.8
1923 [2]	161	2,162	21,287	190,083	10.1	21,652	183,034	10.6
1921 [3]	156	1,922	19,089	156,575	10.9	18,040	141,889	11.3
1919 [2]	147	1,903	22,843	163,830	12.2	21,511	136,015	13.7
1914	161	1,461	20,780	138,893	13.0	10,018	61,021	14.1
1909	137	1,237	19,913	116,217	14.6	8,557	43,875	16.3
1904	132	947	17,674	90,345	16.4	6,755	29,218	18.8
1900	133	788	15,578	71,394	17.9	5,438	22,045	19.8
1890	166	630	13,091	48,118	21.4	4,137	14,126	22.7
1880	103	256	7,818	21,067	27.1	1,919	4,782	28.6

[1] Not available.
[2] Exclusive of 2 establishments in Maine, to avoid disclosing individual operations.
[3] Exclusive of 1 establishment in Maine, to avoid disclosing individual operations.

NEW ENGLAND KNIT-GOODS INDUSTRY, 1880–1927, COMPARED WITH REST OF UNITED STATES—Continued

Year	Cost of materials			Value of products			Value added by manufacture		
	Thousands of dollars		New England as per cent of United States	Thousands of dollars		New England as per cent of United States	Thousands of dollars		New England as per cent of United States
	New England	United States outside New England		New England	United States outside New England		New England	United States outside New England	
1927	37,618	386,482	8.9	72,186	744,434	8.8	34,568	357,953	9.7
1925	46,013	407,913	10.1	79,162	730,798	9.8	33,150	322,884	9.3
1923	49,168	434,852	10.2	84,390	763,787	9.9	35,222	328,935	9.6
1921	36,875	323,583	10.2	64,113	569,961	10.1	27,237	246,379	10.0
1919	52,124	374,972	12.2	87,772	625,368	12.3	35,649	250,395	12.5
1914	18,263	128,424	12.5	33,426	225,487	12.9	15,163	97,062	13.5
1909	16,222	94,019	14.7	30,991	169,153	15.5	14,769	75,133	16.4
1904	13,576	63,018	17.7	24.795	111.763	18.2	11,219	48,745	18.7
1900	9,325	41,747	18.3	17,835	77,648	18.7	8,510	35,901	19.2
1890	8,100	27,762	22.6	15,110	52,131	22.5	7,010	24,369	22.3
1880	4,035	11,176	26.5	7,913	21,254	27.1	3,878	10,078	27.8

PRESENT CONDITION OF THE INDUSTRY

The various branches of this industry have undergone different experiences in the last few years. Knit underwear has followed quite closely the recent developments in cotton goods. Here the particular field of New England is in making high-quality products, although the rivalry of other regions in these lines has become more and more keen. In the production of coarse staple underwear New England manufacturers now play a minor part; and, since the country's export trade is made up mainly of coarse staples, the New England product in this branch of textile manufacture does not find any considerable outlet in foreign markets.

Despite adverse conditions of the last few years, a number of the larger New England manufacturers of knit underwear have continued to carry on a profitable business. One of the important assets of such concerns has been their established reputation for high quality, based upon well-known trade-marks. Most of the companies which have met with particular success have been those selling direct to the trade through their own carefully planned selling organizations.

The knitted outerwear industry is one of comparatively recent growth, rising from a national production in 1899 of not more than $8,000,000 to nearly $200,000,000 in 1923. In the last few years fundamental and permanent changes have taken place in the demand for knitted outerwear, so that the present market is less for staples than for novelties, in which emphasis is placed upon color, attractiveness, style, and fit. In these changes the opinion of the trade is that New England manufacturers have often shown a reluctance to fall in line with modern developments, so that the rest of the country has outstripped this region both in volume and in methods of distribution. Recently, however, there are evidences of awakening on the part of New England manufacturers of outerwear.

In the distribution of knitted outerwear there has been a considerable trend toward direct sale to the retail trade, especially to the department stores, chain stores, and large mail-order houses. An authentic opinion from the trade is that not more than 30 or 35 per cent of the business in outerwear now goes to wholesalers. The carrying of stock, which was formerly one of the main functions of the wholesaler, has come to devolve largely upon the manufacturer. The wholesaler's function has become increasingly a financing one, involving the assumption of credit risks and providing a steady stream of orders to assure regular operation.

The following analysis of the experiences of representative makers of knit goods, as presented in their replies to a special inquiry regarding their manufacturing and marketing practices, indicates the general condition of the industry in New England during the last few years.

EXPERIENCES OF KNIT-GOODS MANUFACTURERS

The replies received from manufacturers of knit goods represented nearly two-thirds of the entire 1925 output of New England, which was in excess of $79,000,000. Replies were received from 69 manufacturers, whose sales as reported for 1925 were over $51,000,000 and whose total average employment for that year exceeded 10,000 persons. This knit-goods group includes knitted fabrics made from cotton, wool, rayon, or silk, either alone or in combination.

The establishments were classified, according to the nature of their products, in three groups. The first of these, comprising the manufacturers of underwear for men, women, and children, included 29 establishments with total sales of over $25,000,000, thus accounting for nearly one-half of the total reported. There were 21 firms reporting the manufacture of knitted outerwear, with total sales of nearly $8,000,000. These were principally sweaters and bathing suits. The third group includes manufacturers of hosiery for men, women, and children, in which there were 19 manufacturers with total sales of over $17,500,000.

MATERIALS

The materials most generally used in knit-goods manufacture are cotton and woolen or worsted yarns. Twenty-five firms reported the use of rayon and 20 the use of silk. Of the underwear manufacturers, 14 mentioned rayon and 9 silk, while 13 firms make no mention of the use of either. All the manufacturers of outerwear report the use of woolen or worsted yarns, and three mention silk or rayon. All the hosiery manufacturers report the use of cotton or cotton yarn, while 12 of them use also worsted or woolen yarns, 10 rayon, and 9 silk, and 3 use some reworked wool. Thus over half of the reporting underwear manufacturers and manufacturers of hosiery use rayon or silk, or both. These materials find very little use in outerwear manufacturing. All the outerwear manufacturers and many of the hosiery manufacturers report the use of woolen or worsted yarns, while all the hosiery manufacturers use some cotton yarn. The cotton, rayon, and silk materials used by these manufacturers were obtained, in the majority of cases, from sources outside New England, while woolen and worsted yarns were purchased from local sources.

SIZE AND AGE OF ESTABLISHMENTS

The group includes establishments in each State, with a wide range in size of individual operations. Of 59 knit-goods manufacturers reporting annual sales figures, there were 15 whose sales in 1925 exceeded $1,000,000 each; 14 with sales between $500,000 and $1,000,000; 21 between $100,000 and $500,000; and 10 under $100,000. Sixteen of the underwear manufacturers exceeded $500,000 each, while 11 were less than $500,000. Only 6 of the 16 outerwear manufacturers and 7 of the 15 hosiery manufacturers exceeded $500,000. There were 10 underwear manufacturers, 3 manufacturers of outerwear, and 2 manufacturers of hosiery each having sales exceeding $1,000,000. It thus appears that there was a relatively higher proportion of large firms reporting in the underwear group than in either of the other two.

Of 62 knit-goods manufacturers indicating average annual employment, 32 reported an average of fewer than 100 persons, and 30 reported more than 100 persons employed. Twenty-six establishments reported employment between 100 and 500 persons each, while 2 underwear manufacturers and 2 hosiery manufacturers employed over 500 persons each, 1 hosiery manufacturer employing nearly 1,000 and another nearly 2,000 persons. Only four of the outerwear manufacturers exceeded an employment of 100 persons, and the highest number for these four was 350 persons. Only 8 of the 27 manufacturers of underwear employed fewer than 100 persons, while 9 of the 15 hosiery manufacturers gave employment to fewer than 100 persons.

That the manufacture of knit goods is one of the older industries of New England is indicated by the fact that 12 of the reporting establishments have been in existence continuously over 50 years and one of these more than 100 years. Eighteen establishments have been in existence between 25 and 50 years, and 14 between 10 and 25 years. It is apparent, however, that this industry has had considerable development in recent years, as there were 25 firms reporting an age of less than 10 years, and 10 of these had been established within 5 years.

The manufacture of underwear in New England is much older than that of hosiery or outerwear; 20 of the 29 underwear firms were over 25 years old, while only 7 of the 19 hosiery firms, and only 3 of the 21 outerwear firms, had been in operation 25 years. On the other hand, only 4 underwear plants had been established within 10 years, in contrast to 8 hosiery firms and 13 outerwear firms.

Changes in management within the past 10 years were indicated by 16 of the knit-goods manufacturers, six of which took place after 1921. There were 7 underwear manufacturers doing over a $500,000 business in 1925, whose business had changed management within 10 years, while there were 4 outerwear and hosiery establishments whose management had been changed within that period; in addition there were 4 large new establishments in these lines. No tendency was indicated to change from the original use of plants, and practically no instances were found where manufacturers had shifted from another line of products to the manufacture of knit goods. Branch plants were reported by 9 companies with a total of 18 branches; of these 13 are in New England, 3 in the South, 1 in Philadelphia, and 1 in New Jersey.

Increases in capacity of plants since 1921 were indicated by 19 establishments, with additions ranging from slight amounts to a doubling of capacity. A large Massachusetts manufacturer of infants' and children's underwear and hosiery, whose sales have shown a substantial growth each year, reported that his plant capacity was more than doubled. A New Hampshire manufacturer of women's and infants' underwear doing a $500,000 business increased his production 100 per cent in 1926 by consolidating with another mill in the same State. A small Rhode Island manufacturer of worsted bathing suits and jerseys reported a doubling of production; and a small Massachusetts manufacturer of worsted, rayon, and mercerized cotton half hose increased his production capacity by 100 per cent. A medium-sized establishment in Connecticut, making ladies' silk hose, increased its capacity 80 per cent, while a manufacturer of athletic underwear in that State doing a $500,000 business reported increased production of 60 per cent. Increases of 50 per cent were reported by a Massachusetts manufacturer of ladies' silk hosiery, and by a New Hampshire manufacturer of a general line of worsted and cotton hose doing a $500,000 business, while a Massachusetts manufacturer of men's, women's, and children's underwear doing a $2,000,000 business reported the addition of two new buildings. A number of other firms reported increases of 10 to 25 per cent in their producing capacity.

PLANT ACTIVITY

The relative degree of activity in knit-goods manufacture in 1925 is shown by the fact that of 57 firms reporting, 33 were operating their plants at 75 per cent or more of maximum capacity, while there were 16 operating at one-half to three-fourths of maximum capacity and 8 others below one-half capacity. The manufacturers of hosiery and of underwear reported a higher proportion of activity than did those of outerwear. Twelve hosiery manufacturers out of 19 reporting were running at 75 per cent of capacity, or better, while there were 16 of the 25 underwear replies indicating such activity, in contrast with only 5 of the 13 replies for outerwear. All but two of the knit-goods establishments doing business of $1,000,000 or over in 1925 were operating at 75 to 100 per cent of their maximum capacity.

TREND OF SALES

The trend of sales from 1921 to 1925 was indicated by the replies of 51 concerns which gave continuous figures for each of these years. Thirty-nine of these concerns had greater sales in 1925 than those of 1921, while 12 firms showed a reduction. For the 2-year period from 1921 to 1923 there were 41 establishments whose sales showed an increase, while there were 10 that had decreased sales. Underwear manufacturers showed for these periods a distinctly higher proportion of increasing sales than did the outerwear and hosiery manufacturers. All but 1 underwear firm increased their sales from 1921 to 1923, and all but 4 increased from 1921 to 1925; while there were 9 outerwear and hosiery manufacturers whose sales decreased from 1921 to 1923, in comparison with 17 whose sales increased; and 8 firms whose sales in 1925 were less than those in 1921, compared with 18 whose sales showed an increase for the period.

For the 2-year period from 1923 to 1925 there were 55 reporting manufacturers of knit goods whose sales as a total showed a very slight increase—3 per cent—for 1925 over those for 1923. The total sales for 1923 were $49,848,000; for 1924, $45,199,000; and for 1925, $51,340,000. In 1924 the total sales decreased 9.3 per cent from the preceding year, but this decrease was offset by an increase of 13.6 per cent in the year following. Of the 55 concerns making up the total figures, increased sales from 1923 to 1925 were shown by 31 establishments, whose total sales in 1925 exceeded $30,000,000, the average rate of increase being 23 per cent; while there were 24 firms. representing total sales in 1925 of over $21,000,000, whose individual sales decreased, with an average rate of 16 per cent for the group.

The 25 underwear manufacturers included in these figures showed total sales in 1925 practically the same as those in 1923, there being only the very slight decrease of two-tenths of 1 per cent. Sixteen of these establishments showed an average rate of increase of about 14 per cent, while nine others showed an average decrease of about 17 per cent. In contrast, the 30 outerwear and hosiery manufacturers showed an average increase of 6.4 per cent from 1923 to 1925. Included in these were 15 firms whose aggregate sales in 1925 were 36.7 per cent greater than in 1923; and 15 other concerns showed an average decrease of 15.4 per cent for the same period. Comparison of these figures indicates that a higher proportion of the underwear establishments had increases in sales from 1923 to 1925, as well as from 1921 to 1923, than was the case with the outerwear and hosiery manufacturers; but that among individual establishments making outerwear and hosiery there was a much greater contrast than among those making underwear.

LOCATION OF MARKETS

Over two-thirds of the firms making knit goods indicated that a majority of their sales were made outside the New England States. The principal markets outside New England were indicated to be in the Middle Atlantic States and in the Middle West. Nineteen manufacturers indicated that they distributed their products nationally, 7 marketed a portion of their products on the Pacific coast, while only 3 indicated sales in the Southern States. Competition is most often mentioned as coming from southern cotton manufacturers or from the Middle Atlantic States.

Only two manufacturers indicated exports in any considerable volume. A manufacturer of athletic underwear doing a $500,000 business reports exports amounting to 4 per cent of his sales, while a hosiery manufacturer doing an annual business worth several million dollars has upward of one-fourth of his sales outside the United States.

MARKETING PRACTICES

Although a number of manufacturers did not indicate their practice in regard to the use of trade-marks, there were 48 who made definite statements. Of this number 30 firms reported the use of trade-marks on half or more of their products, while 13 use a trade-mark on less than one-half, and 5 firms stated no use of trade-marks. No pronounced contrasts were indicated between makers of underwear, outerwear, and hosiery.

Of 38 firms which indicated their practice regarding advertising, there were 21 making use of advertising mediums and 17 which stated definitely that they do no advertising. Fifteen of these 21 firms report national advertising, 3 report local advertising, and 3 use both. The manufacturers of underwear and hosiery indicated various advertising mediums, the principal ones being magazines, newspapers, and trade journals. Among the outerwear manufacturers, trade journals stand out as the principal mediums. Nine firms indicated this, while several others reported the use of dealer helps, direct mail, and newspaper.

The average selling cost in 1925, as reported by 52 knit-goods manufacturers, was approximately 10 per cent of total sales for that year.

CHANNELS OF DISTRIBUTION

The distribution channels prevailingly used by manufacturers of knit goods are direct sales to retailers or sales to wholesalers. Forty-seven firms indicated that they use only one channel of distribution, and 21 other concerns make use of two or more channels. Of those using single channels, 20 firms reported that they make their sales direct to retailers, 16 make sales direct to wholesalers, while 8 reported sales through commission agents and 3 sell direct to the consumer. Where more than one channel of distribution is used, the most frequent combination is wholesaler and retailer or wholesaler and commission agent. A few concerns reported selling to exclusive wholesale or retail distributors.

The form of sales organization prevailing among the larger manufacturers of knit goods is indicated by quotations from the executives of representative plants. One of these states:

> We have four salesmen carrying our line exclusively and three carrying it in connection with another line. We pay our men on a commission basis with usual drawing account. This has proven very satisfactory.

Another states:

> We have six salesmen traveling out from New York all over the United States, from Maine to California, and down as far as Texas. They receive their compensation through commissions for sales rendered. The territory is divided among these men, who travel at least three or four times a year over the same territory. Methods of studying the markets are through these different salesmen.

According to another:

> We have five salesmen, and most of the directing is done from our New York office, where we have three permanent men on salary and commission. This office and the mill work together on the best methods to follow. We believe the best way to get the business is to keep after it and give the best service possible.

Two other executives report that sales are handled entirely from their New York offices, one of these selling through a commission agent who handles the actual selling and the relationship to the trade.

The practice of marketing through a selling house is explained by one executive as follows:

> Our general sales plan is the same now as in the past. We have a commission house in New York that sells, bills, etc. This guarantees all accounts, so we do not have any losses from this source; but in a few cases, where the merchandise is made up on orders and in the warehouse in New York or here, when the time for shipment comes the selling house does not consider the customer safe. The result is that the goods are left on our hands to be sold, generally at a loss over what we should have received for them. At the present time we are not contemplating very strongly making a change in our method of selling.

From another executive comes the following:

> Our goods are distributed to sales territories planned by our selling agents, who travel with them from New York, covering the entire country. We also sell our goods through the offices of our corporation. We believe that the time has come when more individual sales policies should be adopted. By this I mean that manufacturers should have their own sales-organization men on their pay roll, either with a drawing account or a commission basis, whichever will work out the most satisfactorily to both. We also believe that a representative should not handle other lines which conflict. In fact, I believe that the high-pressure salesmanship concentrated on one line is much more effective, and should we feel that we could afford to adopt this new plan I think ultimately it would work out to our interest. As the initial expense for the first year or two would be quite high, the results might not be as satisfactory as we desire; and it is a question whether the missionary work done in a year or two will lay the foundation for a satisfactory trade.

A company which deals directly with the retailer and does not sell to jobbers provides compensation for its 60 salesmen according to the possibilities of the territory and their experience, using intensive national advertising to stimulate consumer demand, and also to facilitate introduction of goods in new territory by the personal visit of salesmen.

Another manufacturer describes his sales organization thus:

> In our case we have about 20 salesmen covering the entire United States, excepting the Pacific coast, which has been assigned to a jobber distributing our underwear under own own plans. Our men are paid in various ways, including straight salary, straight commission, and drawing account against a commission. Territories are assigned in such a way as to secure the most business in any particular section, at the same time allowing the salesmen an opportunity to secure a fair return. The markets are studied by noting results through consultation with buyers and salesmen and other distributors.

Another manufacturer discusses the distribution of his efforts as follows:

> We employ a couple of line salesmen who are generally on commission, and we are endeavoring at the present time to obtain more extensive coverage of the more densely populated States and Territories, and thus endeavor to set quotas for all our various salesmen.

The number of changes and improvements reported by different manufacturers indicates that the knit-goods industry in New England has put forth a good deal of effort to adjust itself to changed conditions in marketing and in type of demand for its products. Most of the replies indicate special attention to sales and marketing methods, and to management and production factors. Changing from cotton or woolen to rayon and silk products or mixtures has been quite general.

One manufacturer of knit underwear, doing a business in excess of $500,000, whose sales have shown a steady but conservative increase since 1921, mentions the development of a full line of rayon garments, and emphasis upon lower price production numbers. He also speaks of having effected improvement in production control through monthly records of cost-account statistics. Another underwear manufacturer, doing a $2,000,000 business and employing 500 workers, states that production control has reduced work in process about 50 per cent, and that sales in New England have been increased by changing from knit underwear to rayon and silk.

Another concern having a continuous increase in sales states that production and quality have increased at least 33⅓ per cent since 1921, as a result of improved management and organization, while a Boston manufacturer of infants' and children's underwear says that standardization has improved his product 20 per cent. Another manufacturer of a similar line, doing a $1,500,000 business, speaks of balancing inventory with demand, to cut down investment, at the same time having merchandise for customers' prompt requirements. He credits his continuous increase in sales to "up-to-date sales methods, good merchandise, and service to customers, applying broad viewpoint learned from dealing with entire country, and trying to forget that what our grandfathers did should never be changed."

One of the largest manufacturers of knit and nainsook underwear in New England, selling a trade-marked product direct to retailers, has developed rayon products to keep up production, naming as the most important improvement "better balance, prompter service, more even production."

A small manufacturer of women's silk and rayon underwear speaks of improvement of product, and closer figuring to meet competition, while a manufacturer of athletic underwear, whose sales in New England have been decreasing, attributed this falling off to a demand for cheap merchandise.

One of the larger hosiery manufacturers, with a national distribution of silk and silk-mixed hosiery, reports an increase of sales resulting from the development of sales efforts; while a small manufacturer of men's half hose credits increased sales to a more aggressive selling campaign. A manufacturer in western Massachusetts, with a $500,000 business operating at full capacity, whose trade has grown substantially every year since 1921, credits the increase in sales to larger production and improved merchandise, supported by sales and marketing methods. This manufacturer sells direct to retailers.

A new hosiery concern, which started in 1922 in a small way, has had a pronounced growth, with two separate additions to the capacity of its plant. Increased sales are credited to selling organization and new sales methods.

A million-dollar firm operating at full capacity, with a gradual increase since 1921, which makes 75 per cent of its sales in New England, credits the increase in New England sales to the more intensive covering of local territory, and lowered manufacturing costs through production control.

A company doing several million dollars' worth of annual business in hosiery, with a newly added line of underwear, had a falling off in sales from 1922 to 1923; but by making adjustments then its business has shown a continuous growth each year since. The greater portion of its product is marketed through wholesalers, but some through retailers direct. Increased sales in New England are credited as due to improved service, quality, and distribution. Its treasurer writes as follows:

> There has been a constant improvement in quality and distribution, to which many factors have contributed. The main efforts are directed to development of export markets in a climate that uses our product during the slack season, and to styling the product to widen our domestic market during this slack period. The organization of a styling department with executive authority and wide scope for collecting data is an important development.

A small Rhode Island manufacturer of men's seamless hose, selling his product direct to wholesalers, states:

> In the past we have found that we are not able to sell locally. After repeated efforts we have abandoned the idea of selling both to the New England jobber and to the retailer. New York jobbers at present, and Chicago jobbers in the past, have been our best customers.

Decreasing sales of a New Hampshire manufacturer of woolen hosiery, whose product is marketed through a commission agent in New York City, are explained as resulting from changes in mode of wearing apparel and from inability to manufacture goods that the trade demands in his section. This manufacturer states:

> Buying policies of jobbers during the last five years have changed very materially. Instead of placing their orders well in advance of their requirements, or rather anticipating their requirements, they will not place orders with the manufacturers now until well into the season, thus causing mills to run slack or close down several months during the year.

A large manufacturer of wool bathing suits, sweaters, and sport garments, doing a national business of over $1,500,000, expresses another difficulty in his line, as follows:

> We believe that we have one of the most thoroughly equipped mills in the country. Our line consists, for the greater part, of staple-styled merchandise, in contrast with fancy merchandise. We constantly add new and up-to-date equipment. We turn out, we believe, more bathing suits and sweaters than any other mill of equal size. There are only a few large mills of similar nature in New England, but there are many small plants concentrating on one or another of our products.

The influence of changes in demand for the product of knit-goods manufacturers and of changes in the methods of merchandising is shown in the following representative statements:

> Changes in consumer demand and buying policies have been great during the last five years. Buying is all on a hand-to-mouth basis, and demand in hosiery lines is for fancy goods. This makes a very difficult problem.

Another manufacturer states:

> We find a little better demand for novelty goods than in the past few years, but not enough demand in safe staples or semistaples to warrant running more than a percentage of the machinery.

A manufacturer of women's underwear states as follows:

> There has been a tremendous change in women's underwear toward extremely light weights, and to silks. The consequence from the knitting standpoint is that three years ago we took up rayon underwear for women, and to-day our rayon end of it is 55 per cent of our gross sales. There has developed, how-

ever, especially with manufactures going direct to the retailer, a particularly perplexing and difficult problem in the fact that the old method of advance fall and spring buying is now a thing of the past. It is almost impossible now for manufacturers to obtain retailers' adequate advance orders. Their buying policy has gone to such an extreme that we have examples of many of the largest retailers in New England buying and replacing their stock in quantities of two-twelfths of a dozen. This seems to us to be as acute a problem to overcome as anything we have to face in our industry. It comes down to a matter of barely covering overhead for six months of the year, and then such a tremendous in-season requirement of fall merchandise, covering a period of only about three months, that it is impossible for the manufacturer to give the degree of service that the retailer is demanding to-day. This is accompanied, of course, by the additional expense attendant to giving a degree of service, making a tremendous peak in production, and many other difficulties.

Manufacturers of men's underwear are facing a similar situation, as indicated by the following statement:

There has been a decided change in the consumer demand in our industry in the last 10 or 15 years. Apparently fewer men are wearing wool underwear, which is to the disadvantage of our particular branch of the knitting industry. The buying policy of most of our customers is also changed, and many of our largest and best customers now follow a more hand-to-mouth policy than formerly.

The influence of these changes in buying practices upon the manufacturers is summed up in the following statement by a prominent executive:

The changes which have taken place in the consumer demand depend on the class of trade to which one is selling. We have sold principally to jobbers. They have in the past few years resorted to the hand-to-mouth policy of buying. I believe that this change has forced the manufacturers to seek new trade, and that in a great many cases manufacturers are going direct to what might be called the cooperative buying—large department stores and mail-order houses—omitting the small retail dealer. As we view this trade as outlined, they will anticipate as much as the jobber, and their requirements are as great as the jobber's; so that to manufacturers who have been selling to jobbers I believe this class can be included in their trade without serious effect to the jobber, as I do not feel that the jobber could sell these large users. I will admit that there is a great deal of opposition on the part of the jobbers to manufacturers serving this trade.

Following is a significant statement by another executive:

The most notable change which has taken place in consumer demand and buying policy during the last five years is evident from the hand-to-mouth buying policy which has been adopted by the retailer. This brings about new problems to the manufacturer which compel him to utilize every means possible in order to avoid being loaded up with unsalable merchandise. The policy of the merchant formerly was to carry a reasonable stock and to place advance orders, but now he expects the manufacturer to carry the stock without any advance information as to what his customers' requirements may be. Ours being a style proposition, in addition to having to carry a large inventory we have great difficulty in deciding what this inventory should consist of. Formerly the advance orders gave us this information, but without it the situation is much more difficult. However, we aim to be alert to the style trend and this year we have so anticipated it that we have run our factory 100 per cent all the year, and on certain numbers are sold for the balance of the year.

The effect of changed retailing practices upon manufacturing is indicated in the following discriminating analysis by another executive:

Under the modern efficiency methods of retailing, the retail stores, with the idea of securing a quick turnover and increased volume, demand of all departments that to-day's sales must show an increase over yesterday's, this week's over last week's, this month's over last month's, and this year's over last year's. This is accomplished by forced sales advertised extensively. For these sales the manufacturer is expected to furnish special merchandise, or at least merchandise at a special price. This is his contribution to the sale, and can only be made at a sacrifice of his own profits. The increased advertising cost is sometimes shifted to the consumer, but quite often even this is financed by contributions from the manufacturers or jobbers. It seems that the retailers have lost sight of the fact that if the manufacturers do not have profits we can not have prosperity. This special merchandise is bought in quantities which compare favorably with the quantities of regular merchandise bought a few years ago. The regular merchandise itself is purchased in very small amounts indeed. The manufacturer or jobber is thus forced to carry stock subject to the immediate order of the retailer. This method of doing business must necessarily increase the detail of the retail stores and consequently increase their expenses, if we are to judge results by the increased cost which we have found from our own experience with the small fill-in order business.

Whereas five years ago retailers were content with a 50 per cent mark-up, none of them are now content with less than 60 per cent, and many demand a mark-up anywhere from 60 to 100 per cent. The manufacturers and jobbers have not been able to follow along with corresponding mark-ups, due to the decreased demand for knit underwear, and the consequent increase in competition among the manufacturers. In their case, then, the increased cost of small-order distribution has not yet been transferred. That in the near future it will be goes without saying. A tendency in this direction is already apparent in the unwillingness of many manufacturers to decrease underwear prices despite the marked decrease in the price of the raw cotton itself. While it is true that yarn prices and underwear prices in most cases have discounted the decrease in the price of raw cotton, there seems, nevertheless, to be an effort on the part of the manufacturers to resist any further decline until they are in a position to amply cover their costs.

It is not only the policy of making small purchases which has increased the cost of distribution, but there has also arisen the necessity of having the salesmen call quite frequently, only to be put off with little or no business, time and time again. Compared to the procedure under the old advance-order method of purchasing, when the salesmen found it necessary to call only once a season, it is readily apparent that this method of frequent calls by the salesmen has added considerable expense to the distribution cost. It is nothing unusual for an underwear plant doing a business of $3,000,000, and having a stock varying from $400,000 to about $800,000, to receive orders which it can not fill from even these large stocks. The reason is plain. It no longer has advance orders, and if for any reason a particularly large demand comes for styles for which we did not have more than ordinary sales in the previous year, and which we have no way of anticipating, some customers are bound to be disappointed.

WEARING APPAREL

The importance of New England as a producer of wearing apparel is not fully appreciated. Although in this line the manufactures of this section comprise only 3.3 per cent of the total United States production of clothing, woven underwear, furnishings, shirts, hats, fur goods, and other articles of wearing apparel, yet the New England value of these products in 1925 was more than $182,000,000. These industries engaged over 40,000 persons and gave employment to more than 36,000 wage earners, who received nearly $37,000,000 in wages.

Nearly 900 establishments of varying sizes were engaged in these lines of manufacture, providing a market for nearly $96,000,000 worth of materials and adding over $90,000,000 to the New England revenue, as indicated by the value added by manufacturing.

IMPORTANCE OF INDIVIDUAL ITEMS

New England has national prominence in the manufacture of corsets, with 30.4 per cent of the national product in 1925; in fur-felt hats, with 38.5 per cent of the United States total; in suspenders, garters, and related items, with approximately 17 per cent; and in straw hats, with 15.7 per cent of the national output. Of men's clothing New England produced only 4 per cent, and of women's clothing less than 3 per cent of the national output; of shirts, about 6 per cent; and of other men's furnishing goods, about 8 per cent.

Of the items of principal importance in New England, the manufacture of men's and boys' clothing, including suits, overcoats, and work clothing, leads, with a product valued in 1925 at approximately $43,800,000. Women's and children's clothing, including suits, dresses, aprons, and underwear, comes next, with a product valued at nearly $34,400,000. Fur-felt hats manufactured in New England were valued at $31,500,000, and corsets were valued at more than $23,400,000. Other items of substantial importance were shirts, with a value exceeding $12,000,000; millinery and lace goods, over $9,600,000; men's furnishing goods, nearly $8,400,000; and fur goods, $7,375,000. Other minor products of considerable importance in the aggregate were suspenders, garters, and related items, worth over $4,600,000; straw hats, worth $4,429,000; and cloth hats and caps, with a value exceeding $2,500,000. The importance of each of these items in the manufacturing activity of New England is shown in the following table.

MANUFACTURE OF WEARING APPAREL IN NEW ENGLAND, 1925 AND 1927

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Men's clothing:						
1927	238	9,109	9,536	21,827	43,484	21,657
1925	261	8,507	9,388	22,447	45,795	21,348
Women's clothing:						
1927	333	8,591	9,544	23,104	44,381	21,277
1925	296	6,932	7,054	18,741	34,395	15,654
Hats, fur felt:						
1927	38	5,763	8,221	20,903	39,121	18,218
1925	43	5,618	7,561	16,758	31,500	14,743
Corsets and allied garments:						
1927	29	4,081	2,497	8,716	19,251	10,536
1925	28	5,093	4,139	11,381	23,431	12,050
Shirts:						
1927	41	3,710	2,716	5,949	11,461	5,512
1925	38	3,064	2,157	6,294	12,141	5,847
Millinery and lace goods:						
1927	49	2,750	2,823	3,962	8,761	4,799
1925	57	1,834	1,621	5,125	9,632	4,687
Men's furnishings:						
1927	37	1,968	1,934	6,177	11,448	5,271
1925	31	1,693	1,160	4,505	8,383	3,878
Fur goods:						
1927	36	491	778	2,237	3,857	1,620
1925	62	908	1,303	4,196	7,375	3,179
Suspenders, garters, and other elastic woven goods:						
1927	15	909	767	3,599	5,142	1,543
1925	17	763	608	3,058	4,634	1,576
Straw hats:						
1927	4	233	239	345	822	477
1925	12	1,343	1,217	2,113	4,429	2,317
Hats and caps, cloth:						
1927	45	342	465	1,124	2,254	1,130
1925	47	371	566	1,317	2,514	1,197
Total:						
1927	865	87,947	40,518	97,942	189,983	92,041
1925	892	36,126	36,772	95,933	182,229	86,440

LOCALIZATION OF INDUSTRY

Although these industries are of principal importance in Massachusetts and Connecticut, they are of considerable prominence in each of the New England States. The manufacture of men's and boys' clothing and of cloth hats and caps is localized to quite an extent in the region about Boston, largely because of the importance of that city as a market for these products. Numerous individual establishments, however, are scattered around New England in the small centers where there is a ready supply of labor. Women's garments, as well as a considerable amount of men's and boys' apparel and shirts, are manufactured to quite an extent in Connecticut, for which a market is found in New York City. Woonsocket, R. I., is a center of handkerchief manufacture. The centers for the manufacture of corsets are Bridgeport and New Haven, in Connecticut, and Worcester, in Massachusetts. The principal center for the manufacture of fur-felt hats is Danbury, Conn., while straw hats are made principally in Massachusetts.

The importance of each State in the individual lines of manufacture is shown for 1925 and 1927 in the following table.

MANUFACTURE OF WEARING APPAREL IN NEW ENGLAND, BY STATES, 1925 AND 1927

MEN'S CLOTHING

States	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	19	952	895	1,387	3,404	2,017
1925	30	1,143	1,605	2,158	5,400	3,242
Maine:						
1927	13	437	265	513	1,015	503
1925	11	384	301	857	1,458	601
Massachusetts:						
1927	195	7,141	7,925	18,642	36,648	18,005
1925	206	6,230	6,948	17,625	33,890	16,265
New Hampshire:						
1927	8	463	369	1,107	2,046	939
1925	7	430	357	1,252	2,002	751
Vermont:						
1927	3	116	82	178	372	193
1925	7	320	176	555	1,044	489
Total:						
1927	238	9,109	9,536	21,827	43,484	21,657
1925	261	8,507	9,388	22,447	43,795	21,348
WOMEN'S CLOTHING						
Connecticut:						
1927	48	2,404	2,223	3,737	8,192	4,455
1925	49	2,067	1,696	2,746	6,108	3,362
Massachusetts:						
1927	277	6,022	7,207	19,071	35,649	16,578
1925	233	4,435	5,076	15,534	27,297	11,764
New Hampshire:						
1927	4	118	85	226	396	169
1925	5	107	70	169	315	146
Rhode Island:						
1927	4	47	30	70	144	74
Maine:						
1925	4	69	40	44	110	66
Vermont:						
1925	5	254	174	249	565	316
Total:						
1927	333	8,591	9,544	23,104	44,381	21,277
1925	296	6,932	7,054	18,741	34,395	15,654

Manufacture of Wearing Apparel in New England, by States, 1925 and 1927—Continued

HATS, FUR FELT

State and year	Establishments	Wage earners	Thousands of dollars: Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	34	5, 548	7, 999	20, 099	37, 758	17, 659
1925	38	5, 495	7, 561	16, 758	31, 500	14, 743
Massachusetts:						
1927	4	215	222	804	1, 363	559
Total:						
1927	38	5, 763	8, 221	20, 903	39, 121	18, 218

CORSETS

State and year	Establishments	Wage earners	Thousands of dollars: Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	17	3, 138	2, 805	6, 838	15, 199	8, 361
1925	18	4, 047	3, 306	9, 082	18, 938	9, 856
Massachusetts:						
1927	12	943	693	1, 878	4, 053	2, 175
1925	10	1, 046	833	2, 299	4, 494	2, 194
Maine:						
1925	8	119	145	510	953	443
Total:[1]						
1927	29	4, 081	3, 497	8, 716	19, 251	10, 536
1925	28	5, 093	4, 139	11, 381	23, 431	12, 050

[1] Excluding Maine.

SHIRTS

State and year	Establishments	Wage earners	Thousands of dollars: Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	19	1, 823	1, 393	3, 008	5, 728	2, 720
1925	16	1, 332	935	2, 950	5, 735	2, 784
Maine:						
1927	8	602	398	853	1, 647	794
1925	9	536	378	1, 143	1, 977	834
Massachusetts:						
1927	10	1, 059	802	2, 078	3, 937	1, 859
1925	13	1, 196	845	2, 200	4, 429	2, 229
Vermont:						
1927	4	226	123	9	148	139
Total:[1]						
1927	41	3, 710	2, 716	5, 949	11, 461	5, 512
1925	38	3, 064	2, 157	6, 294	12, 141	5, 847

[1] Excluding Vermont.

MILLINERY AND LACE GOODS

State and year	Establishments	Wage earners	Thousands of dollars: Wages	Cost of materials	Value of products	Value added by manufacture
Connecticut:						
1927	6	459	534	506	1, 475	969
1925	11	1, 086	902	3, 195	6, 275	3, 080
Massachusetts:						
1927	33	1, 445	1, 362	2, 313	4, 494	2, 180
1925	46	748	718	1, 930	3, 537	1, 606
Rhode Island:						
1927	10	846	927	1, 143	2, 793	1, 650
Total:						
1927	49	2, 750	2, 823	3, 962	8, 761	4, 799
1925[1]	57	1, 834	1, 621	5, 125	9, 632	4, 687

[1] Excluding Rhode Island.

MANUFACTURE OF WEARING APPAREL IN NEW ENGLAND, BY STATES, 1925 AND 1927—Continued

MEN'S FURNISHING GOODS

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of product	Value added by manufacture
Connecticut:						
1927	11	870	936	3, 106	5, 370	2, 264
1925	8	670	374	1, 655	2, 958	1, 303
Rhode Island:						
1925	4	157	93	698	1, 116	418
Massachusetts:						
1927	26	1, 098	998	3, 071	6, 078	3, 007
1925	19	866	693	2, 151	4, 309	2, 158
Total:						
1927[1]	37	1, 968	1, 934	6, 177	11, 448	5, 271
1925	31	1, 693	1, 160	4, 505	8, 383	3, 878

[1] Excluding Rhode Island.

FUR GOODS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of product	Value added by manufacture
Massachusetts:						
1927	36	491	778	2, 237	3, 857	1, 620
1925	36	677	1, 017	3, 218	5, 638	2, 421
Connecticut:						
1925	10	68	86	385	570	185
Rhode Island:						
1925	3	23	35	54	134	80
Vermont:						
1925	5	21	19	29	80	51
Total:						
1925	62	908	1, 308	4, 196	7, 375	3, 179

SUSPENDERS, GARTERS, ETC.

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of product	Value added by manufacture
Connecticut:						
1927	7	286	279	1, 577	2, 123	547
1925	7	154	114	946	1, 327	382
Massachusetts:						
1927	8	623	488	2, 022	3, 019	997
1925	10	609	494	2, 112	3, 306	1, 194
Total:						
1927	15	909	767	3, 599	5, 142	1, 543
1925	17	763	608	3, 058	4, 634	1, 576

STRAW HATS

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of product	Value added by manufacture
Massachusetts:						
1927	4	233	239	345	822	477
1925	12	1, 343	1, 217	2, 113	4, 429	2, 317

HATS AND CAPS, CLOTH

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of product	Value added by manufacture
Connecticut:						
1927	9	83	117	368	634	265
1925	9	70	94	261	468	206
Massachusetts:						
1927	36	259	347	756	1, 620	864
1925	38	301	471	1, 055	2, 046	991
Total:						
1927	45	342	465	1, 124	2, 254	1, 130
1925	47	371	566	1, 317	2, 514	1, 197

EXPERIENCES OF MEMBERS OF THE INDUSTRY

Special information regarding manufacturing practice and the marketing of products during the past few years was obtained from 155 manufacturers of wearing apparel, with aggregate sales in 1925 of $63,352,000. These represented 35 per cent of the total New England production as reported by the United States Census, and nearly 40 per cent of the wage earners. Massachusetts was represented in this total with 93 replies; Connecticut, 40; Vermont, 7; Maine and New Hampshire, 6 each; and Rhode Island, 3.

The representation in the various lines of products was as follows: Men's and boys' clothing and shirts, 58 replies; women's and children's clothing, 55; fur-felt hats, 15; men's furnishing goods, 10; corsets, 9; straw hats, 8.

Among this representative group of manufacturing establishments the reasons given most frequently for locating or continuing in New England were labor conditions, nearness to market for their products, and transportation facilities. Another important factor has been the availability of raw material. Aside from these economic reasons many concerns have located their establishments in New England because of its being their home and native environment. Proximity to the New York market is of significance in the industries which are localized in Connecticut, particularly those making corsets, shirts, and felt hats; while the Boston market has been an important factor in the location of the clothing industry in or near the metropolitan area.

AGE OF ESTABLISHMENTS

In the clothing industries the average period of operation of all reporting establishments was 20 years. Of 65 makers of men's and boys' clothing and shirts, two-thirds had been established within the preceding 25 years and 19 of these within the last 10 years, while 6 others were over 50 years old. Of 55 establishments making women's and children's clothing, three-fourths had been established within the preceding 25 years, of which 20 came into existence in the last decade, and only one was over 50 years old. In the men's clothing group established within the last 10 years, 12 concerns were makers of suits and overcoats, and 6 made shirts.

The average period under present management among all these clothing replies was 14 years. Changes in management had taken place in the preceding 6 years among 14 per cent of the 123 concerns. Twelve manufacturers of men's clothing reported changes of management within 5 years, and 14 others between 5 and 10 years; while only 11 of the women's apparel manufacturers had changed management in the last 10 years. It appears that the manufacture of women's apparel in New England is of more recent development than that of men's and boys' clothing, but changes in management in recent years have been more frequent among the men's group.

Individual corset-manufacturing plants report periods of operation ranging from 7 to 65 years, with an average of 33 years for the group reporting. The three largest companies reporting have been in operation 50 years or over. Three others had been established within the preceding 20 years, while one medium-sized concern doing a mail-order business had come into existence within the last 10 years.

Although one of the larger and older companies has had a recent change of management, the average number of years under present management for the reporting group is 20. The only change from the original use of plant was the addition of corset manufacturing to an underwear establishment in one instance.

In the fur-felt hat industry, the average period of operation of reporting plants is 34 years, and 16 years under present management. One of the largest companies has been in business over 100 years, another concern 70 years, and two others 50 years, while 3 plants have been established within the last 10 years. Two establishments had changed management since 1921. For the manufacturers of straw hats the average period of operation was 36 years, and 24 years under present management. Only one concern had been established within 25 years and that was 15 years ago. Three had changed management within the preceding 10 years.

SIZE OF ESTABLISHMENTS

For the entire group of apparel manufacturers, numbering 155 concerns, the average of individual sales in 1925 was $408,700, and the average employment in that year was 91 persons per plant. In the men's and boys' clothing group, including shirts, the average for 56 companies was $377,000 and 73 wage earners per company. Nearly one-half of this number had individual sales between $100,000 and $500,000, and nearly one-third of them did a business of less than $100,000. There were 5 companies with individual sales exceeding $1,000,000 a year, and these with 6 others exceeding $500,000 accounted for 65 per cent of the total sales, while 12 companies, employing over 100 persons each, accounted for 67 per cent of the employees.

In the women's apparel group the average size of business for 43 companies was $221,000 each, and 59 persons per plant. No concern reported sales exceeding $1,000,000. Fourteen companies having individual sales between $250,000 and $750,000 accounted for 60 per cent of the total of those reporting, while 20 companies with sales between $100,000 and $250,000 account for slightly over one-third. Only 6 manufacturers of women's clothing report employment of over 100 persons each, while 26 companies had from 25 to 100 employees, and 16 employed under 25. The average size of company in the women's group is much smaller than in the men's group.

The average size for 15 companies manufacturing fur-felt hats, with total sales of nearly $16,000,000, was $1,058,000 per establishment, and 180 employees. There were 7 large companies with annual sales exceeding $1,000,000, including 1 concern with over $2,000,000 and 1 over $3,000,000; 2 establishments between $500,000 and $1,000,000, 5 between $200,000 and $500,000, and 1 small establishment under $100,000. Seven large companies employed between 100 and 500 persons each, and 1 other employed more than 500.

The concerns manufacturing straw hats are much smaller, the average for 7 companies being $386,500 in annual sales and 114 in number of employees. Three establishments had sales between $500,000 and $750,000 each; 3 others had sales between $200,000 and $300,000, and 1 had a total of $50,000. None of these concerns employed more than 200 persons.

In corset manufacturing the average size of 9 companies with total sales of nearly $11,000,000 was $1,370,000, and the average number of employees was 397 per establishment. One company reported sales of several million dollars, and 3 others exceeded $1,000,000 each. The largest company employed nearly 1,500 workers, and 2 others over 500 persons each.

Of 8 concerns making garters, suspenders, and handkerchiefs, the average size was $456,000, and the average number of employees was 66. Only 1 company had sales exceeding $1,000,000, and 2 others had sales of $500,000 each. Only one company employed over 100 persons.

Few manufacturers in these apparel groups reported any branch plants. In the clothing group nine establishments reported branches, all located within New England. Two companies had branch plants in Maine and one other had a branch in New Hampshire. The other branches were in the State of the parent company. One Connecticut shirt manufacturer reported a branch plant in the same State. No branches were reported by manufacturers of corsets or hats.

CHANGES IN CAPACITY OF PLANTS

While increases in plant capacity since 1921 were indicated in numerous instances, the proportion of these increases to the total number of concerns was relatively small. Among the manufacturers of men's clothing 15 of the 65 replies indicated increases ranging from 25 to 100 per cent. These increases were mostly among the outerwear manufacturers, although one shirt manufacturer reported an increase of 175 per cent. Three manufacturers of outerwear reported decreases in their capacity. No significant changes were indicated among the women's clothing group. Two manufacturers of dresses and one of infants' wear and aprons reported increases of 100 per cent each; 4 other companies reported increases of 50 per cent each, while 2 companies reduced their capacity by 50 per cent.

In the felt-hat group three plants reported increases of 50 per cent and one of 12½ per cent. One small company making hatter's fur reported an increase of 50 per cent. No increases were reported by corset manufacturers, except by one company doing a business of $500,000, which increased its capacity 25 per cent in 1925 by the addition of other garment manufacture. A maker of suspenders and garters doing a $500,000 business reported a 300 per cent increase, and a $100,000 company making handkerchiefs reported a 90 per cent addition. No increases are reported by the manufacturers of straw hats.

RELATION OF OUTPUT TO MAXIMUM CAPACITY

In the men's clothing group of 49 companies indicating their 1925 output, 27 reported operations from 75 to 100 per cent of maximum capacity, and 7 of these were operating at full capacity; 18 were operating at 50 to 75 per cent, and 4 concerns at less than one-half capacity. The manufacturers of work clothing and shirts showed generally a lower output than the makers of suits and overcoats.

Of 43 companies replying in the women's clothing group, 25 reported their output ranging from 75 to 100 per cent, and 5 of these were operating at full capacity. All the others were at 60 per cent or above. In the corset group only one concern reported operations exceeding 80 per cent of capacity and the majority were between 50 and 70 per cent. Of the 15 manufacturers of fur-felt hats, all but 2 were operating at or close to full capacity, thus showing a very prosperous condition. One $1,000,000 company reported operations at 50 per cent of capacity, and a $200,000 company operations at 40 per cent. The manufacturers of hatter's furs, however, showed generally low activity. The largest company operated at only 35 per cent of capacity and 2 others at 50 per cent, while another reported two-thirds capacity and another 100 per cent.

EMPLOYMENT CONDITIONS

One of the difficult problems faced by manufacturers of wearing apparel arises from the high seasonal variation in employment that prevails generally in these industries. This is more pronounced in the manufacture of women's clothing than in men's wear. Between the months of maximum and minimum activity, as shown by the number of persons employed by all New England establishments, the census figures for 1925 show a variation of 20 per cent of the average number of employees for the year in the case of women's clothing, and of 11 per cent in the case of men's clothing.

Many manufacturers have made efforts to reduce this seasonal variation through the development of supplementary products and the manufacture of staple garments during slack periods. Progress along this line is indicated by one-fifth of the establishments making special reports. In men's clothing the month of maximum employment in 1925 was November, followed closely by September and March, while the month of minimum employment was January, followed closely by June. In women's clothing for that year the maximum employment was in the month of March, followed closely by April; while the minimum employment was in January, followed closely by July.

There is considerable variation in the felt-hat industry and pronounced seasonal variation in the straw-hat manufacture resulting from seasonal variation in the demand for their products. Some of the manufacturers of fur-felt hats meet the seasonal situation by making hat bodies in the rough, or manufacturing for stock during slack periods. In straw-hat manufacturing no supplementary products seem to be possible.

USE OF INCENTIVE METHODS OF WAGE PAYMENT

The apparel industries make extensive use of piecework methods of payment of employees. Ninety-two per cent of the manufacturers of men's and of women's clothing reported the use of some incentive method of compensation, many establishments paying their entire working force in this way. For the entire group the average of the percentages stated by individual companies was 58. All but two of the shirt manufacturers reported at least half of the employees on some kind of piecework basis. Among corset manufacturers the proportion of workers affected by incentive methods of payment varied from 60 to 85 per cent, this high proportion probably being partly in consequence of the large scale of employment that prevails in this group. Practically every concern making felt and straw hats reported a high proportion of their factory workers on a piecework basis, the average of percentages for individual firms being 75.

IMPROVEMENTS EFFECTED

The apparel industries as a whole have been quite actively engaged in improving their manufacturing practices. Reduction in accidents, better control of production, improved relations with employees, better organization and administration, cost-accounting methods, closer attention to maintenance of machinery and equipment, and inspection of products, have been the principal lines of improvement. Comments from individual concerns along these lines mentioned closer cooperation with workers, reduction in overhead costs, improved organization and more accurate determination of cost of products, and the avoidance of overstocking by balancing production capacity with demand.

One manufacturer reports that development of purchasing schedules has resulted in a small amount of raw stock in proportion to sales, while another credits production control with a resulting reduction in inventory of raw and finished materials. Another manufacturer has put 95 per cent of his employees on a piecework basis and remarked that this has stimulated production and increased the employees' earnings, and has lowered costs. Another states that production control has brought about the adjustment of different items of the inventory to correspond to the rate of turnover, so that a smaller inventory is necessary for the same volume of sales. A manufacturer of suspenders and garters emphasizes the elimination of cancellations and the standardization of products.

SOURCES OF MATERIALS

The more important raw materials in clothing manufacture—cotton goods, woolen goods, thread, and buttons—are purchased, in the majority of cases, within New England, while silk goods usually come from outside sources. Corset materials, consisting of cloth, steel, and elastic, are likewise purchased almost entirely within New England and come from New England sources. The raw materials used by the manufacturers of felt hats, consisting of hatters' fur, shellac, and dyes, are obtained, by the majority of the reporting companies, from sources outside of New England; but a portion of the hatter's fur is prepared in near-by establishments, whose supplies of raw skins come from Australia, Italy, or other European countries. The straw-hat group obtain their straw braid and hat bodies usually from sources outside the United States.

SALES TRENDS

Examination of statements of individual clothing manufacturers in both the men's and women's group discloses a general increase in business from 1921 to 1923, with a slight falling off in sales of men's clothing from 1923 to 1925, but an increase in the case of women's clothing for this latter period. Among the group whose trend of sales had been upward during this period the reason generally given was extension of sales territories and new or more aggressive selling methods, while a majority of the group which had decreasing sales attributed their downward trend principally to high labor costs.

Forty manufacturers of men's and boys' clothing and shirts, with total sales of $15,000,000 in 1925, showed a sales increase from 1921 to 1925 amounting to 17 per cent—advancing 30 per cent in the first two years of this period but falling back 10 per cent in the later two years. Fifty-one establishments in this group, whose sales in 1925 totaled $19,500,000, showed a net falling off from 1923 to 1925 of 3 per cent. This decline occurred in 1924, when it amounted to 7 per cent, and was followed in the next year by an increase of 4½ per cent.

In the women's garment group 27 companies, giving continuous figures from 1921 to 1925, with total sales in the latter year of $5,900,000, showed an increase of 24 per cent over the 5-year period, the advance from 1921 to 1923 being 16 per cent and that from 1923 to 1925 being 6.7 per cent. Thirty-eight companies giving figures for the latter period, with total sales amounting to more than $8,500,000, showed an increase of 7 per cent in sales from 1923 to 1925. There was a slight falling off in 1924, followed by a full recovery in 1925.

Among the manufacturers of men's and boys' clothing there were nine companies, including one with sales of $2,500,000 in 1925, which showed a continuous increase from 1921. A manufacturer of outer wear with a $500,000 business showed a substantial increase from 1921 to 1924, but a falling off in 1925. Another outer-wear manufacturer doing over $3,000,000 worth of business showed a falling off in 1924 but recovered in 1925. A shirt manufacturer, doing nearly a $1,000,000 business, and several other clothing manufacturers show regular increases from 1923 to 1925. Others fell off in 1924 but increased in 1925, one of the latter being a manufacturer of work clothing with sales of over $500,000. Decreases in 1925, compared with 1924, were shown by 15 companies. Only a few of these were shirt manufacturers, the latter generally showing substantial increases. Within this group of men's and boys' clothing comparisons according to specific products are significant. Twenty-two manufacturers of suits and overcoats with 1925 sales totaling $12,870,000 show a falling off from 1923 of 5.3 per cent; 15 shirt manufacturers with 1925 sales of $3,550,000 show an increase from 1923 of 10.5 per cent; and 14 manufacturers of work clothing with 1925 sales of $3,085,000 show a decrease from 1923 of 4.7 per cent, but an increase from 1924 of 6.1 per cent. A manufacturer of children's dresses doing a $400,000 business showed a steady and regular increase in sales since 1921, and a manufacturer of women's dresses with sales of $600,000 shows a 30 per cent increase from 1923. Several medium-sized manufacturers of aprons and of infants' and children's wear selling their products both in New England and nationally, as well as several manufacturers of children's muslin underwear, show substantial prosperity.

Among the manufacturers of garters, suspenders, and handkerchiefs, seven companies with aggregate sales of $3,100,000 showed an average increase from 1921 to 1923 of 6 per cent and a corresponding setback from 1923 to 1925. Five companies showed an increase in sales in the latter period, and 2, including a garter manufacturer doing a $1,500,000 business, fell off; while 2 manufacturers of garters, each doing a $500,000 business, showed substantial increases, one of them more than doubling. A manufacturer of men's neckwear, with $200,000 in sales, also showed a steady growth. A manufacturer of handkerchiefs, doing a $100,000 business and selling his products to chain stores, doubled his production from 1921 to 1923 and more than doubled it again from the latter year to 1925.

Of the manufacturers of corsets and brassières, eight companies with sales of nearly $11,000,000 in 1925 showed a sharp falling off of nearly 20 per cent in aggregate sales from 1921 to 1923 and made a slight total increase from 1923 to 1925. Three small companies increased in the earlier period, but each of the larger ones had a pronounced drop. The largest one reporting made a substantial advance in the earlier period through the addition of underwear and other supplementary lines. A $500,000 company showed a steady increase in sales each year from 1921 to 1925.

In the manufacture of fur-felt hats, 14 companies whose sales in 1925 were nearly $15,500,000 had increased 90 per cent above the total for 1921. There was a 50 per cent increase in the first two years, while sales in 1925 showed an increase of over 36 per cent above those in 1923. Each company showed increased sales in the earlier period, and all but two showed increases in the latter period, these two having relatively slight reductions. The reasons for this pronounced upward trend in sales of felt hats are given as the extension of selling areas and the improvement of selling organizations.

Total sales of the seven manufacturers of straw hats, aggregating $2,700,000 in 1925, increased up to 1923, but show a pronounced decrease since then, each of the seven showing a decided decline. The declining sales of straw hats are attributed to competition from other sections, especially from foreign concerns. One manufacturer of straw hats expressed the general opinion that local concerns can not compete with the prices of goods imported from Italy and other European countries.

LOCATION OF MARKETS

The markets for men's and women's clothing and shirts is mainly within New England, or in New York City. Of 60 replies from manufacturers of men's and boys' wear, all but 11 indicated that 50 per cent or more of their output was sold in New England. Twenty-six of these said that they sold 90 per cent or more in New England, and 38 reported over 75 per cent. The trend of New England sales as indicated in the replies, was evenly divided between increases and decreases. Nine manufacturers of suits and overcoats and 4 of shirts and work clothing mentioned the Middle West as their market; 3 manufacturers of suits and overcoats sell on the Pacific coast, and 2 in the Southern States. Three manufacturers of shirts and one manufacturer of work clothing report their market in the Southern States.

Out of 47 manufacturers of women's and children's wear, 30 indicated the majority of their sales in New England, and one-half of the replies stated 75 per cent or more to be New England sales. Eleven other companies report not over one-fourth of their sales in New England, and seven of these less than 10 per cent.

Trends of New England sales were about evenly divided among the individual concerns as increasing and decreasing, while several said there was no change.

The principal market for the corset manufacturers was indicated to be outside of New England. Only one company, with $300,000 in annual sales, selling 60 per cent of its products in New England, finds its principal market in this section; all the others reported only from 2 to 15 per cent of their total sales in New England. The large companies have national distribution. One large manufacturer sells through New York City, and another large company markets its products mainly through retailers in the Southern States. A company with sales of $200,000 markets 90 per cent of its products in the Middle Atlantic States and Ohio; four companies sell to retailers through New York and Chicago; another sells its product through a mail-order house in the Middle West.

The principal market for fur-felt hats is New York City; only a small proportion of sales is made in New England. The smallest company reporting, with sales under $100,000, markets its whole product in New England; a $500,000 company reports 15 per cent of its sales in this section; and a $1,000,000 company sells 25 per cent locally. None of the other manufacturers sell over 10 per cent of their goods in New England. One company has its principal market in the Middle West and South and another in the South and Western States. Hat materials manufactured by New England concerns are generally sold direct to near-by hat manufacturers.

The market for the straw hats manufactured in this section is well distributed, and is located mainly outside of New England. One company, however, doing a $600,000 business, reports all its sales in New England, and another of half this size sells 50 per cent in New England. The other concerns report from 5 to 20 per cent of their sales within New England. One company sells in the Middle West and another sells in New York City. Two concerns report national distribution. A $700,000 manufacturer sells his products in New England, New York, and the Pacific coast. A manufacturer in eastern Massachusetts states:

> We sell about 5 per cent of our output in New England, but the bulk of it is sold in the Middle West, where we have some manufacturing competition, and where they have a big advantage over us, not only in cost of transportation and quicker delivery, but in the regulation of working hours, which are more conducive to cheap production than in this State.

Direct exports appear to be of minor importance with the manufacturers of apparel. This is particularly true of men's and women's clothing, in which the manufacturers report practically no exports.

A corset manufacturing concern doing a $2,000,000 business exports 30 per cent of its products, while another concern of half that size exports 15 per cent, and one with $300,000 sales reports exports of 7 per cent. A corset manufacturer doing several million dollars' worth of business reports that his exports amount to 6 per cent of the total. The proportion of exports has increased considerably among these corset manufacturers during the last few years, and fuller development of export trade is receiving special attention by some of them.

A large manufacturer of felt hats reports exports of 2 per cent, and another small concern reports 1 per cent of total sales. A large manufacturer of straw hats exports 1 per cent, and another straw-hat manufacturer reports small shipments to Canada. A manufacturer of athletic equipment also reports exports of 1 per cent.

DISTRIBUTION CHANNELS

In the marketing of men's and women's clothing, the prevailing channel of distribution is direct sales to the retailer. A majority of the manufacturers of men's and boys' clothing indicated this single channel, and only a few mentioned any other. Sales to wholesalers and direct to consumers were reported as supplementary channels in numerous cases, both of men's and of women's clothing. Three manufacturers of men's suits and overcoats and one manufacturer of women's underwear report selling solely through selling agents, and three other manufacturers of women's underwear report this channel as supplementary to others. All the reporting corset manufacturers sell their products direct to retailers, one of them marketing its entire product to a mail-order house. Manufacturers of finished felt hats sell their product mainly direct to retailers, but two medium-sized manufacturers sell their product through sales agents. Hats in the rough are sold mainly to hat wholesalers, but three of these manufacturers sell their product direct to other hat producers. Straw hats are sold through commission houses or to wholesalers, although one concern sells its product direct to the retailer.

USE OF BRANDS AND TRADE-MARKS

Among manufacturers of men's and of women's clothing the use of a trade-mark or brand on the product is general, but not universal. Of 50 manufacturers of men's and boys' clothing who indicated their practice in this respect, 38 brand the majority of their products, and 22 of these use a trade-mark on their entire output. Only five of this group stated that none of their product is trade-marked. In the women's clothing group, of 27 concerns replying, 18 reported the use of a trade-mark on all or most of their products, while 9 stated that they use no trade-marks at all. Among the corset manufacturers, trade-marks are reported as used in every case except one small company, and another medium-sized company which sells its product to a mail-order house. The finished product of felt-hat manufacturers is generally trade-marked, as well as the product of some concerns making hats in the rough. None of the straw-hat manufacturers indicated the use of trade-marks.

USE OF ADVERTISING MEDIUMS

The use of advertising mediums runs generally parallel to the practice in regard to trade-marks. It is influenced, of course, to a large extent, by the type of distribution channel through which the product of the manufacturer is marketed.

Of 50 manufacturers of men's and boys' wear who indicated their practice in this connection, 29 stated the use of advertising, while 21 reported no advertising. Part of the concerns employed national advertising, but the majority reported the use of local mediums. The most common single advertising medium reported in this group is direct mail, although newspapers, magazines, and dealer helps were mentioned in a number of replies. In the women's clothing group, 20 companies stated that they use advertising, while 18 reported no advertising, and 17 others made no reply. A variety of mediums are used in which no single medium stands out prominently. The corset manufacturers generally employ national advertising, in which trade journals are the principal medium. One large company, however, depends mainly upon newspapers, and one of the largest uses magazines with national circulation, supplemented by trade journals and dealer helps. Of the felt-hat manufacturers, 8 companies reported the use of advertising, while 4 stated that they do no advertising, and 4 others made no reply. One of the larger companies depends mainly upon newspaper advertising, but trade journals and magazines are the principal mediums used by the others.

Recognition of the importance of sales and marketing is evidenced among this group of wearing-apparel manufacturers by the large number of concerns which stated that in their plans for future business they are giving emphasis to new and better methods of merchandising, along with special attention to management.

LEATHER AND LEATHER GOODS

The New England industries connected with leather making and the turning out of footwear and other finished leather products are surpassed only by the metal industries and textile manufacture as a source of revenue to the region. Thus the leather group is third in importance to the people of New England. It provided not quite 8 per cent of the income derived in 1925 from all New England manufactures, while textiles provided about 27 per cent and the metals group nearly 32 per cent. In its share of the national leather industry, however, this activity holds a considerably more prominent position than that indicated by its relation to other industries of New England. The factories of this section provided about 30 per cent of the national revenue from all leather manufactures and gave employment to nearly one-third of the wage earners employed in the country's leather industries.

Approximately 100,000 wage earners in New England obtain their livelihoods from this source, and more than $113,000,000 was paid to them by these industries in 1927. There were 1,235 factories sharing in this activity, the gross value of the output of which in that year exceeded $500,000,000. The net revenue, as indicated by the value added by manufacture, outside the outlay for materials, was in excess of $217,000,000. The industry provided a market for materials used in manufacture (including fuel, power, and supplies) exceeding $209,000,000.

LOCALIZATION OF PRODUCTION

The general localization of the New England leather industries is indicated in the following table. It is observed that their activities are confined, in the main, to three States. Massachusetts represents 79 per cent of the New England total, while New Hampshire contributed 11 per cent and Maine 9 per cent. In the other three States—Connecticut, Rhode Island, and Vermont—the leather industries are of slight importance.

IMPORTANCE OF ALL LEATHER INDUSTRIES IN INDIVIDUAL STATES OF NEW ENGLAND, 1925 AND 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:							
1927	1,076		76,449	90,795	235,645	412,161	176,515
1925	1,167	86,330	76,792	89,769	214,930	391,274	176,345
New Hampshire:							
1927 [1]	80		12,686	12,747	31,848	53,385	21,537
1925 [2]	76	14,199	12,829	12,432	31,260	55,975	24,715

[1] Includes only boots and shoes and boot and shoe findings.

[2] Not including New Hampshire, 9 establishments.

IMPORTANCE OF ALL LEATHER INDUSTRIES IN INDIVIDUAL STATES OF NEW ENGLAND, 1925 AND 1927—Continued

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Maine:							
1927 [3]	54		10, 179	9, 463	20, 092	38, 627	18, 535
1925 [4]	53	11, 115	10, 137	9, 719	19, 822	40, 088	20, 265
Connecticut:							
1927 [5]	20		389	428	1, 504	2, 647	1, 142
1925 [6]	13	450	396	428	1, 678	2, 796	1, 119
Rhode Island:							
1927 [7]	5		34	30	136	261	126
1925 [8]	4	18	14	28	96	181	85
Total:							
1927	1, 235		99, 737	113, 463	289, 225	507, 081	217, 856
1925 [9]	1, 313	112, 112	100, 168	112, 376	267, 786	490, 314	222, 528

[3] Includes only leather, tanned, boots and shoes, and findings.
[4] Not including Maine, 3 establishments.
[5] Includes only leather, tanned, and belting.
[6] Not including Connecticut, 18 establishments.
[7] Includes only boot and shoe findings.
[8] Not including Rhode Island, 6 establishments.
[9] Not including Vermont, 7 establishments.

LINES OF MANUFACTURE

The New England leather industries are here considered in three classes, according to the general nature of the manufacturing processes and the type of market for which the products are made. The first class includes what is termed the primary manufacture of leather. This includes the tanning of hides and skins and the preparing and finishing of leather for market as a product for use in further manufacture. This primary class plays a relatively small part, contributing about one-eighth of the total New England revenue from the whole leather group.

The principal New England activity in the leather-working industries is in connection with the manufacture of footwear. This includes not only the making of boots and shoes but other activities accessory to the shoe industry, designated as the making of cut stock and of boot and shoe findings. This class of manufactures comprises more than four-fifths (84 per cent in 1925) of the contribution of the whole leather group to the manufacturing income of New England.

There is also a minor group of miscellaneous products in which leather is the principal material. This group includes a number of items, of which the principal ones are belting, trunks, suitcases, pocketbooks, harness, and various other leather articles. These are of slight importance, comprising only about 3 per cent of the whole New England leather group.

The importance of the individual lines of leather manufacture in New England and the changes that have taken place in them from 1925 to 1927, with the exception of the activities of a few plants, are shown in the next table. This gives a picture of the leather manufactures for New England as a whole.

It is observed that in the gross value of products the New England total in 1927 shows an increase amounting to more than $16,000,000 above that for 1925. The cost of materials, however, was greatly increased and consequently there was a reduction in the net revenue for the group, amounting together to about $5,000,000. Total wages paid in 1927 exceeded those of 1925, but the number of wage earners shows a slight falling off. A material falling off is noted also in the number of establishments, comprising a net reduction of 78 plants.

IMPORTANCE OF INDIVIDUAL ITEMS IN LEATHER INDUSTRIES OF NEW ENGLAND, 1925 AND 1927

Item and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Leather, tanned, curried, and finished:							
1927 [1]	124		11, 106	14, 992	49, 212	79, 936	30, 723
1925 [2]	128	11, 959	10, 745	14, 558	43, 679	72, 821	29, 142
Boot and shoe products:							
1927	996		86, 473	96, 172	232, 172	413, 084	180, 912
1925	1, 067	97, 531	87, 213	95, 474	215, 564	402, 450	186, 886
Boots and shoes:							
1927 [3]	576		77, 840	86, 478	169, 646	324, 033	154, 387
1925 [4]	635	87, 994	79, 313	86, 591	168, 049	331, 689	163, 640
Findings:							
1927 [5]	280		6, 027	6, 686	22, 267	38, 402	16, 135
1925 [6]	250	6, 399	5, 390	6, 046	20, 211	35, 210	14, 998
Cut stock:							
1927 [7]	140		2, 606	3, 008	40, 259	50, 648	10, 389
1925 [8]	182	3, 138	2, 510	2, 837	27, 304	35, 551	8, 248
Miscellaneous:							
1927	115		2, 158	2, 300	7, 842	14, 063	6, 221
1925	117	2, 622	2, 210	2, 345	8, 542	15, 043	6, 501
Belting:							
1927 [9]	26		424	571	3, 675	5, 494	1, 820
1925 [10]	22	778	678	808	4, 940	7, 516	2, 575
Trunks, suitcases, and bags:							
1927 [7]	24		418	477	1, 100	2, 333	1, 232
1925 [11]	28	692	578	656	1, 476	2, 977	1, 501
Pocketbooks, purses, and card-cases:							
1927 [7]	11		397	341	724	1, 543	819
1925 [12]	8	255	209	196	389	895	507
Saddlery and harness:							
1927 [7]	6		45	53	166	284	119
1925 [13]	6	66	51	57	124	240	116
Other leather goods:							
1927 [9]	48		874	857	2, 177	4, 409	2, 231
1925 [14]	53	831	694	628	1, 613	3, 415	1, 802
New England total leather products:							
1927 [15]	1, 235		99, 737	113, 464	289, 225	507, 081	217, 856
1925	1, 312	112, 112	100, 168	112, 377	267, 785	490, 314	222, 529
United States total leather products:							
1927	4, 265		315, 991	364, 447	1, 088, 641	1, 869, 305	780, 664
1925	4, 264		315, 288	356, 246	1, 015, 123	1, 767, 581	752, 458
New England as per cent of United States, 1925	30. 8		31. 8	31. 5	26. 4	27. 7	29. 6

[1] Exclusive of New Hampshire, Rhode Island, and Vermont.
[2] Exclusive of 6 establishments in New Hampshire and 1 in Vermont.
[3] Exclusive of Rhode Island, Vermont, and Connecticut.
[4] Exclusive of 4 establishments in Vermont and 4 in Connecticut.
[5] Exclusive of Vermont.
[6] Exclusive of 2 establishments in Rhode Island, 3 in Connecticut, and 2 in Vermont.
[7] Includes only Massachusetts.
[8] Exclusive of 1 establishment in Connecticut.
[9] Includes only Massachusetts and Connecticut.
[10] Exclusive of 7 establishments in Connecticut, 1 in Maine, and 1 in New Hampshire.
[11] Exclusive of 2 establishments in Rhode Island, 2 in Maine, and 1 in Connecticut.
[12] Exclusive of 1 establishment in Rhode Island, 2 in Connecticut.
[13] Exclusive of 2 establishments in New Hampshire and 1 in Rhode Island.
[14] Exclusive of 43 establishments for which no data are given.
[15] Total of items in table.

The primary manufacture of leather shows a material growth in activity, with an increase in the number of wage earners, despite a reduction of four plants. In the boot and shoe group there were approximately 1,000 plants. These show a reduction of 71 from the number reported in 1925. The group as a whole shows a substantial growth in gross value of products, although in consequence of a greatly increased cost of materials there was some falling off in the net value added by manufacture. The boot and shoe group as a whole, however, does not indicate any substantial recession in activity. Wage payments for the group show an actual increase despite some falling off in the number of wage earners employed. The value of the output showed an increase exceeding $10,000,000. Boot and shoe findings and cut stock show material increases in gross value of output, as well as in net revenue, in number of wage earners, and in wages paid. In the miscellaneous leather manufactures there was considerable falling off in activity and in the value of the output, particularly in leather belting.

PRIMARY MANUFACTURE OF LEATHER

The value of the product of the tanning industry in Massachusetts, Connecticut, and Maine in 1927 exceeded $79,000,000. The activity of these States contributed more than $30,000,000 to their manufacturing revenue and afforded a market for materials exceeding $49,000,000. In terms of human activity this industry provided a livelihood to upward of 11,000 wage earners, who received approximately $15,000,000 in wages. In the next table the statistics for these three States are shown for 1927 and 1925, together with the New England totals for these years and for 1914 and 1904; New England's position in the total national production in the latter years is also shown.

The trend of the tanning industry in New England from 1925 to 1927 was generally upward. The gross value of the output shows an increase of about $7,100,000 and the net increase in the region's revenue was about $1,600,000, accompanied by an increase of about 400 wage earners. Approximately the same number of wage earners were employed in 1927 as in 1914. The trend of this New England industry in the last 20 years in relation to the national activity is indicated by the following percentages: 1927, 16.1 per cent of total national value and 18.6 per cent of value added by manufacture; 1925, 15.8 per cent of total national value and 18.8 per cent of value added by manufacture; 1914, 14 per cent of total national value and 16 per cent of value added by manufacture; 1904, 15.5 per cent of total national value and 19.2 per cent of value added by manufacture.

LEATHER, TANNED, CURRIED, AND FINISHED, IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:							
1927	115	----------	10, 768	14, 588	47, 861	77, 649	29, 789
1925	118	11, 614	10, 438	14, 178	42, 431	70, 708	28, 277
Connecticut:							
1927	4	----------	163	224	967	1, 454	487
1925	5	184	158	210	952	1, 479	527
Maine:							
1927	5	----------	175	181	384	832	447
1925	5	161	149	170	296	634	338
Total:							
1927	124	----------	11, 106	14, 993	49, 212	79, 936	30, 723
1925 [1]	128	11, 959	10, 745	14, 558	43, 679	72, 821	29, 142
New England:							
1914 [2]	151	----------	11, 159	6, 463	38, 142	51, 454	13, 312
1904	186	----------	10, 397	5, 165	27, 389	39, 064	11, 675
United States:							
1927	494	57, 487	52, 924	67, 887	331,985	494, 255	162, 271
1925	532	58, 005	53, 043	66, 762	306, 634	462, 014	155, 380
New England as per cent of United States in 1925	24. 1	20. 6	20. 3	21. 8	14. 2	15. 8	18. 8

[1] Exclusive of 6 establishments in New Hampshire, 2 in Rhode Island, and 1 in Vermont.
[2] Exclusive of 2 establishments in Rhode Island and 2 in Vermont.

It is apparent that the tanning industry has held its own in New England in the last two decades. In the 11 years from 1914 to 1925 it showed a much greater rate of increase in New England than in the country as a whole, the New England increase being 133 per cent in comparison with the national increase of 87 per cent. The payments of wages in New England show an increase of 125 per cent, although a falling off in the number of wage earners was shown by the incomplete statistics of the table, from which a number of establishments in New Hampshire were omitted in 1925 but were included in 1914. In the decade preceding 1914, however, the tanning industry in New England showed only a 14 per cent increase, while there was an increase of 35 per cent for the country as a whole. There has thus been no great regional shifting in the tanning industry in recent years, and New England now retains its position in the national output of leather.

In the early history of the tanning industry small local tanneries were scattered throughout the country to provide leather for local consumption. The important productive factors in the early days were local supplies of hides and tanbark. The development of new methods of tanning by chemical processes has led to the concentration of tanning activity in a reduced number of large plants, while the growth and concentration of the meat-packing industry and changes in the sources of supply of hides and skins for tanning have brought about a high degree of localization of the industry in certain sections of New England and of other States.

LOCALIZATION OF INDUSTRY

In New England the tanning industry is largely localized in northeastern Massachusetts. The principal tanning sections are located in a territory within a 40-mile radius from the city of Boston. The southern part of Essex County, with Peabody and the neighboring towns of Danvers and Woburn as its principal center, is the recognized tanning region of New England. There are important tanneries also in Salem, Lynn, Lowell, Norwood, Winchester, and Worcester. The State of Massachusetts had all but 19 of the 137 New England tanning establishments reported by the 1925 census. In Connecticut and in Maine there were 5 establishments each; there were also 6 reported in New Hampshire, 2 in Rhode Island, and 1 in Vermont.

Massachusetts thus accounts for all but a small proportion of this activity in New England. In the country as a whole Massachusetts is surpassed only by Pennsylvania, whose manufacturing income from this source in 1925 was only $1,500,000 greater, although in value of products Pennsylvania surpassed Massachusetts by $17,000,000. The other important leather-producing States are New York, Wisconsin, New Jersey, and Illinois, in the order given. The output of each of these States exceeded $30,000,000, while that of Massachusetts exceeded $70,000,000.

Boston has the largest sole-leather market in the world. This has existed since early times and has developed with the growth of the boot and shoe industry of New England. Eighty-five per cent of the country's leather production goes into the manufacture of footwear. Most of the New England tanning is of stocks for upper shoe leather. There are also a number of establishments which tan sheepskins. Philadelphia is the principal market of the United States for goatskins and for kid leather, and most of the tanneries in the Pennsylvania area are engaged in making these types of leather.

CONDITIONS IN RECENT YEARS

No great mechanical advances have been made in the tanning of leather in recent years. In equipment and tanning machinery the New England industry is considered to be fully on a par with the rest of the country. In the finishing processes—currying, embossing, and graining leather to meet the modern demand of the shoe trade—there has been almost a revolution in manufacture. Great advances have been made in the making of fancy grains and fancy colors in the last 10 years. To meet this demand New England manufacturers have kept well abreast of the rest of the country.

One of the important competitive factors in the tanning industry in recent years has been the establishment of tanneries by some of the large shoe manufacturers, both within and outside New England.

Some of the other factors in the leather industry, particularly from the marketing angle, are presented in the following analysis of the experience of leather manufacturers in New England, based upon conditions existing during the past few years. This summary of recent experiences in producing and marketing leather provides a background for interpreting the position of this New England industry at the present time.

GENERAL VIEW OF THE LEATHER INDUSTRY

Over 70 per cent of the New England leather industry's output and employment, as reported in the census, was represented in replies to questionnaires regarding production and marketing activities received from 53 concerns with aggregate sales over $50,000,000, all located in Massachusetts. These establishments range from small concerns with fewer than 25 workers and with sales under $100,000, to companies doing a business of several million dollars. One-half of the number had an average employment in 1925 of fewer than 50 workmen, and these employed about one-eighth of the total number reported. Over three-fourths of the total employment was by one-fourth of the companies reporting, which had over 100 workmen each. Two establishments were included with over 1,000 employees each. Two-thirds of the companies reported individual sales of less than $500,000 each, and these accounted for only one-seventh of the aggregate sales. Nine establishments with sales between $500,000 and $1,000,000 accounted for over one-fourth, and seven companies with sales exceeding $1,000,000 each accounted for 57 per cent of the total. There were also a number of establishments operating under contract or on a commission basis for which no sales figures were given.

Two large companies were included with several branches outside New England, which reported their entire business for parent plants and branches. Aside from the largest companies, a general tendency is apparent to centralize operations in a single establishment. A few companies report branch plants outside New England—in the States of New York, Delaware, Ohio, Michigan, Wisconsin, and Missouri.

AGE AND OPERATION OF ESTABLISHMENTS

With minor exceptions, the physical plants now in operation were originally built for tanning or finishing leather. One plant now tanning sheepskins formerly made shoe trimmings; another tannery was converted from a woolen mill; while a third, in operation for nine years, was originally built and used as a brewery.

An idea of the age and development of this industry in New England may be had from the fact that the average period of operation of 55 reporting concerns is 23 years, while the period under present management averages 12 years. Twenty of the concerns had been in operation 25 years or more, and 8 of these over 50 years; while 15 had been established within 10 years. Twenty-five companies had been under present management less than 10 years. Changes in management within a 25-year period were reported in 22 instances, and 15 of these changes had taken place since 1921.

FACTORS DETERMINING LOCATION

Of the factors determining the location of these plants in New England, the majority of companies stated that labor conditions and a near-by market for products were chief considerations. The opinion was frequently expressed that New England is the logical center for the tanning industry on account of the near-by market for its products in the shoe industry. Its original development in this section was due largely to the accessibility of raw materials provided by its shipping facilities, and the growth of the shoe-manufacturing industry near by. The basic materials, hides and skins, are practically all shipped in from other sections of the country or are imported from foreign countries; while tanning extracts, chemicals, oils, pigments and dyes, and other materials are usually obtained from the New England market.

PRODUCTS AND PLANT ACTIVITY

The products of these New England tanneries fall into three general classes: (1) Side and upper calf leather for shoes and beltings; (2) sheep and kid leather; and (3) patent leather and other leathers requiring special finishing. One-fourth of the companies reported additions to plant capacities since 1921, ranging in individual cases from 20 to 100 per cent. This expansion took place almost exclusively among the tanners of fancy leathers. The ratio of 1925 activities compared with the maximum possible output for that year was stated by 43 companies, whose aggregate operations showed an average of 69 per cent of their maximum stated capacity. Five companies reported operations at full capacity, 6 others at 90 to 95 per cent, and 11 others from 75 to 90 per cent, while there were 14 operating at 40 to 75 per cent and 7 others whose activity in 1925 was less than one-half of full capacity. The patent-leather group had a smaller proportion of companies operating at high capacity than that of the general group or the sheep and kid group.

LABOR AND EMPLOYMENT

A decided seasonal trend of employment prevails in the tanning industry. Between the months of maximum and minimum employment there was a variation in 1925 of 15.5 per cent of the annual average number of wage earners, as shown by the census for Massachusetts. The period of high employment in that year was in the months of January, February, and March. There was a falling off through April and May, and the months of lowest employment were June and July.

The majority of employees in the tanning industry are paid by the hour or day, the nature of the industry making it difficult to provide payment of workers on a piecework basis to the extent which prevails in some other industries. Most of the concerns reported that they provided some of their workers with piecework or other incentives, but in many cases this does not reach more than 10 per cent of the persons employed.

Supplementary employment to provide for slack periods of activity has found little development in this industry, largely on account of difficulty in developing secondary products for which the existing plant and equipment can be profitably used.

INTERNAL IMPROVEMENTS

The improvements most often mentioned within the plants are the reduction of accidents, along with the standardization of material, production control, efforts to maintain continuous activity, and improvement of relations between management and workers. One manufacturer reports increased production by making more efficient use of floor space, while another reduced the cost of production by development of purchasing schedules and by organization and executive control. A tanner of cheap leather has succeeded in lowering the cost of manufacture by a more continuous operation of his plant.

A manufacturer of chrome splits has found research in increasing and improving the finished products from raw material at lowered cost to be a vital necessity in meeting competition. In another instance the more advantageous purchasing of materials is credited with obtaining an even production throughout the year. A tanner of chrome splits states, "During the last three and one-half years we have made great strides in getting more footage out of our raw material. We have also improved the appearance of our product until it is hardly recognizable against the original. These changes have been fairly general in the chrome splits business, and we have had to keep up with the improvements which the shoe manufacturer demanded."

The attitude of the executives of several of the leading tanneries of New England was sought in regard to the installation of new equipment, together with their interpretation of recent changes in the leather industry, and a description of their individual sales organizations. Although in this industry the attitude regarding new equipment is generally open-minded, in comparison with some other industries, there appears considerable lack of agreement in this respect. Several of the replies indicated the practice of making continuous improvements.

A tanner of chrome splits, however, expressed the opinion that the basic leather-making equipment was about the same that it had been for some years, with the exception that for fancy colored and embossed leathers, machines for spraying on colors have been generally adopted. He held that New England leather manufacturers rely more on skill and on expert knowledge, which is often secret, than on new and up-to-date equipment. A sheepskin tanner expressed the opinion that the manufacturers of leather-working machinery had given neither the time nor the research to new developments that existed in other industries. Another large leather manufacturer states "We design a great deal of machinery for our own use, because of the scarcity of improved equipment for leather work."

SALES TRENDS SINCE 1921

The aggregate net sales of 49 companies, representing a total of $49,000,000, were obtained for each year from 1923 to 1925, and of 42 companies from 1921 to 1923. There was a pronounced increase in sales from 1921 to 1923, exceeding 25 per cent, followed by a decline of 3 per cent in 1924 and of less than 1 per cent in 1925. All the manufacturers except several concerns in the group making sheep and kid leathers showed increases in this period. For the whole group of manufacturers the total volume of business advanced rapidly in 1922 and 1923; there was some decline in 1924 and a slight recovery in 1925. About the same number of firms showed a falling off in sales, in the latter two years, as showed increases. Four large companies with individual sales ranging from one million to several million dollars showed increased sales in this period, while four others in a similar group decreased. All the manufacturers of patent leather except one very small company showed substantial increases from 1923 to 1925. In general, the sales volume of manufactures of staple upper leather showed a decrease, while that of concerns making fancy upper leathers showed an increase.

The major reason for increases of sales given by individual companies was the development of new products, together with lower costs of manufacturing. Decreasing sales were attributed to general overproduction within the industry and to high costs of labor and material.

CHANGES IN MARKET FOR LEATHER

While the leather market has shared the experience of other industries in facing pronounced changes in its outlets and its selling methods, these changes are only reflections of those in the footwear industry resulting from the influence of the style factor and from small-order buying, which have worked almost a revolution in that field. The effect is passed from the shoe retailer back to the shoe manufacturer, and from him to the tanner of leather.

The executive of one large concern expressed this by stating that the up-to-date tanner of upper leather must keep informed of style changes, and must hold his plant in readiness to shift his products from one finish or color to another at short notice. It thus becomes necessary for him to run his plant only for current requirements, whereas formerly the tanner turned out a cheaper product that could be stocked in anticipation of future orders. The shoe manufacturers now expect prompt delivery by express or fast freight, and order in small quantities on account of the fickleness of the shoe styles in vogue. Another leather manufacturer deplores the shoe manufacturer's practice of contracting for his expected requirements and subsequently failing to live up to his contract. While he can place his order as an insurance against a higher price, the leather manufacturer has no corresponding insurance to guarantee that the specified order will be taken.

The effect of the changed buying policies of shoe factories and of changes from leather to other materials was thus brought out by the executive of one of the largest leather companies in New England:

> The buying policy of the shoe factories prior to 1920 was to buy any quantity of leather ahead in anticipation of future business, whereas to-day they buy only upon receipt of orders for their shoes, which means buying from hand to mouth. The demand for leather prior to 1919 was in staple colors such as black, white, and tan, the tan being carried out in possibly four or five different shades. The demand for colors subsequent to 1919 has changed entirely, so that at the present time we are making almost every color imaginable.
>
> Another change in the buying of merchandise by the shoe factories arises from the fact that a great deal of women's shoes are now made of silks and other fabrics, which of course has reduced the consumption of leather going into women's shoes.

A result of the general attitude of shoe manufacturers in buying only for immediate consumption is a tendency to make the industry more and more seasonal, with intensive production during the active season and increased idleness in quiet periods.

LOCATION OF MARKETS

Although New England shoe manufacturers absorb a considerable proportion of the leather output, the replies indicate that most of the leather products are manufactured outside New England. Of 44 companies indicating the location of their sales, 25 stated that they sold one-half or more of their products outside New England, and the 19 others sell the greater part of their production in those States. For the entire group of 44 companies, the reported sales in New England averaged 34 per cent of their 1925 output. This includes a number of concerns which sold upward of three-quarters of their individual products in New England.

Sales outside New England were indicated to be principally in the Middle Atlantic States and in the Middle West. Several of the largest companies have national distribution. The principal sources of competition were indicated to be within New England and from the adjacent States of New York, New Jersey, and Pennsylvania.

The greater number of concerns, including most of the large companies, stated that sales in New England have been decreasing, although some other large companies reported increasing sales in that area.

An important part of the product is exported. Twenty-four concerns in the group, representing total sales of $40,000,000, stated that they export a portion of their output. The average exports for this group were 11.2 per cent of sales in 1925. Several of the largest concerns reported exports ranging from 5 to 7 per cent. A concern doing a $2,500,000 business exports 52 per cent of its products; one small manufacturer reported exports of 75 per cent; and others reported 50, 30, and 25 per cent, respectively.

CHANNELS OF DISTRIBUTION

The prevailing channels of distribution run directly to the manufacturer of shoes and other leather products, or to the wholesaler or jobber. The majority of these concerns indicated sales direct to the manufacturers, but the number selling to wholesale dealers was nearly as great. In a few cases sales are made through exclusive distributors or selling agents, and in one or two instances the companies have their own individual sales outlets.

The sales organization of leather manufacturers runs generally parallel to that in other New England industries, but some manufacturers frankly admit the weakness in this phase of their business. One large and successful concern with an outstanding sales organization has a sales manager and assistants assigned to different parts of the country. It has branch stores for agencies and employs a staff of local salesmen paid on a commission basis, with expense allowance governed by local traveling conditions. This company's representatives do much of their traveling by automobile.

The executive of one of the leading leather companies with national distribution reports sales departments in St. Louis, Cincinnati, New York, Boston, and Chicago. There are at least two salesmen in each department under the control of the general sales manager, either in Chicago or in Boston. Each salesman is assigned certain territories and is provided with a list of the shoe factories located therein. Compensation is on a salary basis, although a change to a basis of individual sales was contemplated.

USE OF TRADE-MARKS AND ADVERTISING

The use of advertising appears to be general among leather manufacturers, the principal medium being trade journals with a national circulation, and direct mail. The use of a brand or trade-mark for identifying the products is general, and in most cases the entire output is sold under trade-mark.

EFFECT OF CHANGED MARKETING CONDITIONS

The conditions under which leather is manufactured and marketed at the present time, in view of the pronounced influence of the style element, together with basic changes in sale sand methods of manufacture in the leather-using industry, have required drastic readjustments by leather manufacturers both in manufacturing and in marketing. These conditions, however, are general, and have not effected this region any more than other sections. With necessary adjustments to meet the new conditions of its market, the industry in New England is strategically situated to prosper. The present influence of the style factor, the prevailing practice of hand-to-mouth buying both by manufacturers and consumers, and the intensive competition in this field make the continuance of former methods of production and sales fatal to the industry.

BOOT AND SHOE INDUSTRIES

In the manufacture of boots and shoes in New England there are numerous plants making accessory products in the form of cut stock and boot and shoe findings. These really comprise a part of the boot and shoe industry, and are, therefore, included to show the aggregate importance of this group of activities. In the three States of Massachusetts, New Hampshire, and Maine this group produced, in 1927, goods with a gross aggregate value of nearly $413,-000,000. An average of 86,439 wage earners gained their livelihood from this source and received more than $96,000,000 in wages. There were 991 establishments in these three States whose activities provided a market for materials aggregating $232,000,000. The group thus contributed not far from $181,000,000 to their manufacturing revenue, as shown in the value added by the manufacturing processes.

In this group the actual manufacture of boots and shoes represents about 88 per cent of the total revenue and 90 per cent of the total wages paid; while the rest is contributed by products made in factories separate from boot and shoe establishments. The position of this group of industries as a whole is shown for 1927 and 1925 for each of the three important States, together with their totals, in the following table. On account of the different conditions of manufacture and marketing that prevail in these industries, a separate discussion is presented, first, for boots and shoes alone, and then for cut stock and findings.

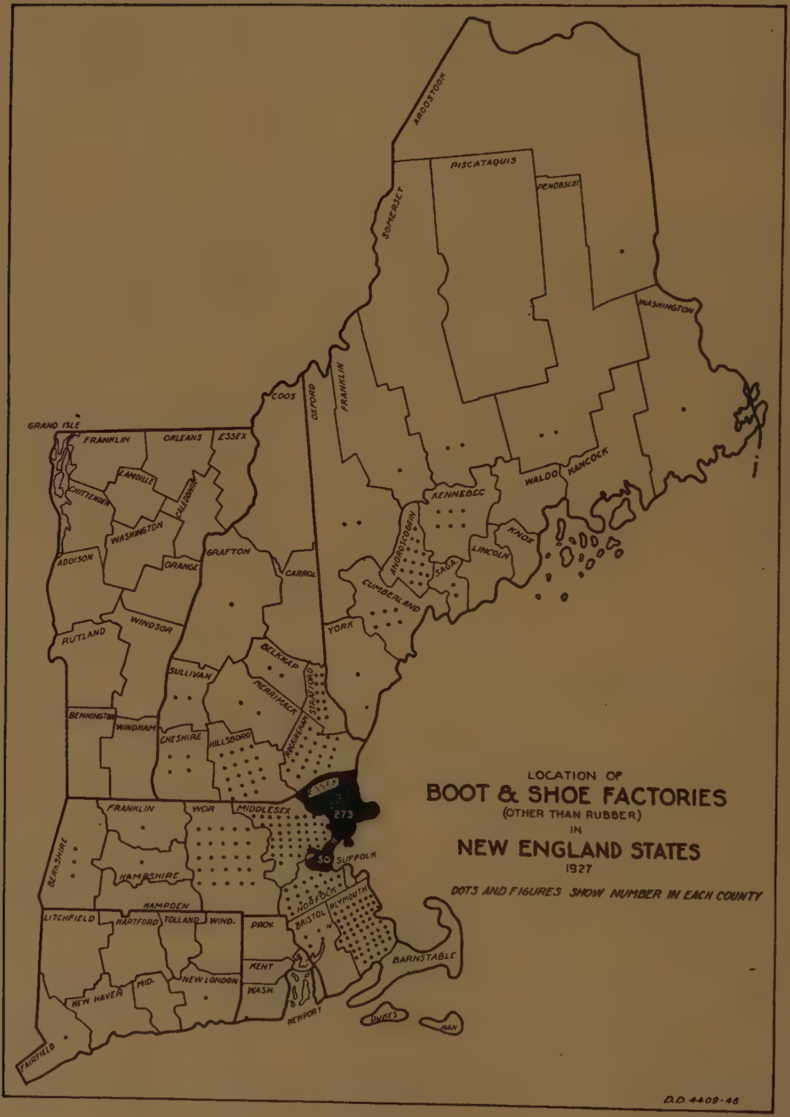

LOCATION OF
BOOT & SHOE FACTORIES
(OTHER THAN RUBBER)
IN
NEW ENGLAND STATES
1927
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
KENNEBEC
WALDO
HANCOCK
ANDROSCOGGIN
KNOX
LINCOLN
SAGA.
CUMBERLAND
YORK
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
273
FRANKLIN
WOR
MIDDLESEX
SUFFOLK
50
BERKSHIRE
HAMPSHIRE
NORFOLK
PLYMOUTH
HAMPDEN
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
BRISTOL
BARNSTABLE
KENT
WASH.
NEW LONDON
MID.
NEW HAVEN
NEWPORT
DUKES
NAN
FAIRFIELD
D.D. 4409-48

Figure 41

Boots and Shoes, Boot and Shoe Findings, and Boot and Shoe Cut Stock in New England States in 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts	862	63, 749	74, 112	180, 481	321, 641	141, 161
New Hampshire [1]	80	12, 686	12, 747	31, 848	53, 385	21, 537
Maine [1]	49	10, 004	9, 282	19, 707	37, 795	18, 088
Total [2]	991	86, 439	96, 141	232, 036	412, 821	180, 786

[1] Not including boot and shoe cut stock.
[2] Not including boot and shoe cut stock in New Hampshire and Maine.

TREND OF BOOT AND SHOE MANUFACTURE IN NEW ENGLAND

The status of New England in this industry over the past two decades appears in the following figures showing the New England percentage of the national value of boot and shoe production and of value added by manufacture:

1927:	
Per cent of national value	36. 8
Per cent of value added by manufacturer	36. 2
1925:	
Per cent of national value	35. 8
Per cent of value added by manufacture	36. 9
1914:	
Per cent of national value	52. 4
Per cent of value added by manufacture	52. 2
1904:	
Per cent of national value	36. 8
Per cent of value added by manufacture	36. 2

In the 11-year period from 1914 to 1925 the contribution of New England to the value of the national production fell off from 52.4 per cent to 35.8; there was also a slight falling back in relative position in the decade preceding 1914. The changes shown by these percentages came about from the great expansion in the shoe industry in other parts of the United States, mainly in the Middle West and in New York State. From 1914 to 1925 there was an increase of 61 per cent in the New England manufacturing income, but the increase for the whole country was about 132 per cent. The 10-year period preceding 1914 showed an increase of 48.5 per cent in New England, in comparison with an increase of 56 per cent for the country as a whole.

The following table shows the total annual production in number of pairs from 1923 to 1928, inclusive, in the New England States, in the country as a whole, and in six of the other principal producing States. In the production of women's shoes New England shows an increase both in actual number of pairs and in its share of the national total. This share shows a falling off from 41.3 per cent in 1923 to 38.4 per cent in 1925, but there was an advance to 44.8 per cent in 1928.

Production of Boots and Shoes in New England and Other States, Calendar Years 1923–1928

[In thousands of pairs]

Class and State	1928	1927	1926	1925	1924	1923
All classes:						
Massachusetts	83, 311	78, 182	72, 851	72, 267	73, 529	89, 517
New Hampshire	21, 499	18, 952	19, 130	18, 296	18, 539	21, 718
Maine	17, 070	16, 085	16, 487	16, 717	15, 031	17, 261
Total (3 States)	121, 880	113, 219	108, 468	107, 280	107, 099	128, 496
New England as per cent of United States	35. 4	32. 9	33. 4	33. 2	34. 2	36. 6
Entire United States	344, 351	343, 606	324, 514	323, 553	313, 230	351, 114
New York	74, 801	75, 627	72, 025	72, 595	69, 853	75, 822
Missouri	46, 060	48, 150	73, 168	72, 467	64, 195	64, 695
Illinois	25, 246	26, 088				
Wisconsin	17, 059	18, 961	17, 537	16, 902	15, 827	17, 150
Pennsylvania	16, 662	17, 610	15, 618	17, 310	19, 265	21, 533
Ohio	15, 324	16, 458	14, 854	15, 621	14, 093	17, 244
Men's:						
Massachusetts	20, 126	20, 841	21, 001	22, 790	23, 244	29, 926
New Hampshire	9, 633	8, 455	8, 270	7, 622	7, 375	8, 023
Maine	4, 320	3, 795	4, 108	4, 078	3, 621	3, 828
Total	34, 079	33, 091	33, 379	34, 490	34, 240	41, 777
New England as per cent of United States	37. 5	34. 7	38. 5	39. 8	40. 4	41. 6
Entire United States	90, 970	95, 328	86, 644	86, 546	84, 663	100, 283
New York	15, 735	16, 736	12, 675	11, 565	11, 091	15, 042
Missouri	15, 422	17, 076	18, 592	19, 015	19, 786	21, 195
Illinois	4, 355	4, 596				
Wisconsin	9, 149	10, 777	10, 275	10, 455	9, 588	11, 241
Pennsylvania	2, 788	2, 636	1, 402	1, 439	1, 495	1, 805
Ohio	1, 019	1, 152	1, 029	1, 393	1, 122	1, 352
Boys' and youths':						
Massachusetts	3, 253	3, 093	2, 959	2, 674	3, 019	3, 483
New Hampshire	2, 044	1, 968	1, 839	1, 412	1, 470	1, 865
Maine	600	446	388	379	420	596
Total	5, 897	5, 507	5, 186	4, 465	4, 909	5, 944
New England as per cent of United States	25. 6	22. 7	24. 6	21. 2	24. 1	26. 7
Entire United States	23, 032	24, 229	21, 111	21, 021	20, 274	22, 239
New York	6, 213	6, 720	5, 288	5, 610	5, 260	5, 862
Missouri	5, 116	5, 266	5, 585	5, 299	4, 599	4, 669
Illinois	867	1, 131				
Wisconsin	1, 335	1, 564	1, 295	1, 347	1, 224	1, 420
Pennsylvania	1, 734	1, 861	1, 815	2, 063	1, 926	1, 551
Ohio	843	1, 009	932	1, 175	987	1, 248
Women's:						
Massachusetts	40, 606	34, 227	30, 521	28, 338	29, 247	32, 597
New Hampshire	6, 161	5, 200	5, 284	4, 914	5, 033	5, 577
Maine	8, 704	8, 546	7, 435	7, 025	6, 102	7, 089
Total	55, 471	47, 973	43, 240	40, 277	40, 382	45, 263
New England as per cent of United States	44. 8	41. 3	39. 2	38. 4	38. 8	41. 3
Entire United States	123, 753	116, 259	110, 447	104, 782	104, 135	109, 676
New York	19, 402	18, 986	19, 979	20, 978	18, 047	17, 124
Missouri	17, 673	18, 468	26, 541	24, 674	26, 315	25, 421
Illinois	8, 197	8, 322				
Wisconsin	2, 672	2, 583	2, 399	1, 943	1, 774	1, 845
Pennsylvania	3, 411	3, 615	3, 196	2, 882	3, 484	3, 780
Ohio	11, 005	10, 569	9, 526	9, 165	8, 685	10, 284
Misses and children's:						
Massachusetts	6, 260	6, 657	6, 330	5, 027	5, 175	6, 380
New Hampshire	2, 774	2, 681	3, 368	3, 753	4, 211	4, 914
Maine	684	705	618	654	803	639
Total	9, 718	10, 043	10, 316	9, 434	10, 189	11, 933

PRODUCTION OF BOOTS AND SHOES IN NEW ENGLAND AND OTHER STATES, CALENDAR YEARS 1923–1928—Continued

Class and State	1928	1927	1926	1925	1924	1923
Misses and children's—Continued.						
New England as per cent of United States	26.2	25.3	26.7	24.4	28.5	29.7
Entire United States	37,135	39,650	38,577	38,691	35,694	40,136
New York	5,021	5,025	4,578	4,609	6,331	5,759
Missouri	4,608	4,283	12,442	12,605	6,560	6,554
Illinois	5,394	6,384				
Wisconsin	2,200	2,119	1,834	1,470	1,617	1,780
Pennsylvania	4,777	5,081	4,818	5,682	6,381	8,008
Ohio	1,946	2,944	2,535	2,915	2,480	3,082
All other:						
Massachusetts	13,065	13,365	12,040	13,437	12,845	17,131
New Hampshire	887	647	370	595	451	1,340
Maine	2,762	2,594	3,938	4,581	4,087	5,110
Total	16,714	16,606	16,348	18,613	17,383	23,581
New England as per cent of United States	24.1	24.4	24.1	25.6	25.4	29.9
Entire United States	69,461	68,140	67,736	72,513	68,464	78,780
New York	28,427	28,220	29,505	29,833	29,124	32,036
Missouri	3,241	3,057	10,008	10,874	6,934	6,857
Illinois	6,133	5,656				
Wisconsin	1,703	1,917	1,734	1,687	1,624	865
Pennsylvania	3,952	4,417	4,387	5,243	5,979	6,389
Ohio	511	783	832	973	819	1,276

LOCALIZATION OF THE INDUSTRY

The greater portion of the New England shoe industry is localized in a few outstanding producing centers. Brockton, with the surrounding Massachusetts towns which comprise the South Shore district, is the great region for making men's shoes. Marlboro is also important in the men's line. In New Hampshire, Nashua and Manchester are also prominent mainly in the manufacture of men's shoes. Production of both men's shoes and women's shoes is important in Auburn, Me. The principal production of women's shoes, however, comes from Boston, Haverhill, Lynn, and Salem, in Massachusetts. In addition to the large specialized centers, there are many towns and cities in these three States in which are located individual shoe factories that contribute substantially to the New England production. (See fig. 41.)

The position of New England in the national production is most pronounced in women's shoes, in which this region contributed 44.8 per cent of the 1928 total. In men's shoes New England produced 37.5 per cent of the national total in that year. In the other classes the position of New England is less important, its 1928 output representing approximately 25 per cent of the total in children's, boys', and infants' shoes and moccasins.

The manufacture of boots and shoes in this region is confined practically to Massachusetts, New Hampshire, and Maine. All but 8 of the 643 establishments reported by the census for 1925 were located in these three States, there being 4 plants in Connecticut and 4 in Vermont. In value of production Massachusetts overshadows the other States, with 73 per cent of the 1927 total, while New Hampshire contributed about 15 per cent and Maine about 11 per cent. In the three prominent States this industry in 1927 engaged the activities of 77,840 wage earners, who received about $86,500,000 in wages, producing goods with an aggregate value of $324,000,000 and providing a market for materials exceeding $169,600,000. The industry contributed to the revenue of these three States nearly $154,400,000, as shown by the value added in the processes of manufacture, outside of the outlay for materials.

These three States in 1925 produced 35.8 per cent of the value of the national output of the industry. Massachusetts is the leading State of the United States, with 26 per cent of the national boot and shoe production for that year. Outside New England the principal producing States are New York, with 20.7 per cent, Missouri with 13.5 per cent, and Illinois with 7.2 per cent of the value of the national output. The production of Missouri and Illinois is now approximately equal to that of New York State. Other important shoe-producing States are Wisconsin, Pennsylvania, and Ohio, in the order given.

In men's shoes the actual number of pairs produced in 1928 was exceeded by production in 1925 but showed substantial increase over 1926 and 1927. In national position the New England production of men's shoes fell off from 41.7 per cent in 1923 to 39.8 per cent in 1925, and to 37.5 per cent in 1928.

In the manufacture of shoes for boys and youths and for misses and children the production of 1928 exceeded that of 1925, although in each case it was less than in 1923; and in the other types there is an actual falling off in number of pairs since 1925.

In common with some other lines of manufacture, the boot and shoe industry in the last few years has been passing through a period of drastic readjustment. Comparison of figures for activity of 1927 with those of 1925 shows a decline of 59 in the number of factories and a reduction of about 1,500 in the number of wage earners employed. There was, however, only a very slight falling off in total annual wages, thus indicating a greater regularity of employment in the latter year. The gross value of the output of the three producing States shows a reduction amounting to about $7,600,000, accompanied by an increase of $1,600,000 in the total cost of materials. Hence, there was a decrease in this 2-year interval of some $9,000,000 in the manufacturing revenue from this industry. The comparative figures for the individual States of New England are shown for 1927 and 1925 in the accompanying table, together with similar data for New England in 1914 and 1904.

BOOTS AND SHOES IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:							
1927	469	----------	55, 986	65, 282	120, 354	237, 517	117, 163
1925	537	63, 869	57, 405	65, 497	119, 765	240, 944	121, 179
New Hampshire:							
1927	63	----------	12, 114	12, 151	30, 008	49, 853	19, 845
1925	59	13, 568	12, 275	11, 911	29, 357	52, 632	23, 275
Maine:							
1927	44	----------	9, 740	9, 044	19, 284	36, 663	17, 379
1925	39	10, 557	9, 633	9, 183	18, 927	38, 114	19, 186
Total: [1]							
1927	576	----------	77. 840	86, 478	169, 646	324, 033	154, 387
1925	635	87, 994	79, 313	86, 591	168, 049	331, 690	163, 640
New England:							
1914 [2]	578	----------	99, 263	58, 620	162, 772	262, 988	100, 216
1904 [3]	614	----------	79, 537	40, 463	113, 524	181, 024	67, 500
United States:							
1927	1, 357	224, 004	203, 110	225, 090	494, 553	944, 714	450, 161
1925	1, 460	228, 601	206, 992	225, 788	481, 632	925, 383	443, 751
New England as per cent of United States:							
1927	42. 4	----------	38. 3	38. 4	34. 3	34. 3	34. 3
1925	43. 5	38. 5	38. 3	38. 4	34. 9	35. 8	36. 9

[1] Exclusive of 4 establishments in Connecticut and 4 in Vermont.
[2] Exclusive of 2 establishments in Rhode Island and 4 in Vermont.
[3] Exclusive of 1 establishment in Rhode Island.

The industry as a whole has made progress in New England in the last few years, and is now in a generally healthy condition. A particularly noticeable change that has come about recently is the development of an attitude of constructive cooperation between workers and manufacturers. Labor in the New England shoe industry has shown, in general, a cooperative spirit which has had a favorable influence in meeting changed conditions. Some of the other factors which have been of particular aid in stabilizing the conditions of this industry are brought out in the discussion of experiences reported by representative manufacturers, in reply to an inquiry by the Department of Commerce.

GENERAL VIEW OF THE INDUSTRY

In response to a special inquiry, nearly 200 shoe manufacturers cooperated in giving information regarding their manufacturing and marketing experience. By 175 of these concerns, with total aggregate sales in 1925 of $189,251,000 and total employment of 46,337 workers, sufficiently complete information was given to provide a fair cross section of the whole industry. These returns represented 57 per cent of the entire New England product, as reported by the census, and 58 per cent of the total wage earners. Massachusetts was represented with replies from 144 concerns, New Hampshire with 18, and Maine with 13.

According to type of product, the largest representation was by a group of 43 companies, making both men's and women's shoes or not specifying the particular type, with sales aggregating over $83,000,000; the manufacturers of women's and children's shoes were represented by 73 companies, with aggregate sales exceeding $50,000,000; while there were 40 companies making men's or men's and boys' shoes, whose sales aggregated $48,500,000; and a small group of 19 companies making slippers, moccasins, and infants' shoes, with sales about $7,300,000.

AGE OF PLANTS

Evidence of the expansion of the industry within recent years by multiplication of plants is given by the high proportion of concerns entering business since the beginning of the World War. Out of 194 companies replying, one-half of the total number had come into existence within 10 years and one-fourth of the total since 1921. The average age for all the concerns is surprisingly low, being only 15 years. This is accounted for to a large extent by the new establishments among manufacturers of women's shoes, where 51 out of 83 replying had been in operation less than 10 years; and over half of these had been in operation not more than 6 years. In the men's group, on the other hand, one-fourth had been established over 50 years, in comparison with one-eighth of the total for all four groups. It is significant that a high proportion of these newer concerns showed a steady increase in volume during their period of operation.

The average period under present management for all concerns was 10 years. Changes of management within the 10-year period are indicated by 15 per cent of the total number, and most of these changes took place after 1921. The group making men's shoes shows a higher proportion of change than does that making women's shoes, and the general group shows less change than any of the others. However, on account of the new concerns in the women's group, over two-thirds of the establishments manufacturing women's shoes had been under their present management less than 10 years, either as newly formed companies or as reorganized companies. This proportion is considerably higher than that for the other groups.

FACTORS DETERMINING LOCATION IN NEW ENGLAND

Of the reasons for locating or for continuing operations in New England, the one given most frequently was labor conditions. It appears that, in the minds of the manufacturers, the skill and availability of the New England workmen for making shoes are the principal factors. Along with this goes the accessibility of leather and other materials, which is partly a cause and partly a consequence of the location of the shoe industry in New England. Proximity to markets ranks third as a factor in the mind of the manufacturers, while other considerations that have considerable weight are financial and transportation facilities.

SIZE OF ESTABLISHMENTS

The average volume of business for the 175 companies in 1925 was slightly over $1,000,000 per establishment ($1,081,430). Over one-half of the total number had individual sales of less than $500,000, and these accounted for only 11 per cent of the aggregate sales. Fifty-one concerns had sales under $250,000 each. There were 40 companies between $500,000 and $1,000,000 accounting for 15 per cent of the total. Of the larger establishments, with individual sales exceeding $1,000,000, there were 44 comprising one-fourth of the total number, and these accounted for 73 per cent of the total reported sales. Included in these were 8 concerns with sales between $2,500,000 and $5,000,000, and 3 others exceeding $5,000,000 each.

Comparisons among the different types of products show a pronounced contrast. The largest average size of the establishment was in the 43 concerns in the general group of men's and women's shoes, with an average of $1,932,500, while it was least in the slipper group, whose 9 companies had an average of only $382,950. The average for the men's group, $1,212,375, was not far from twice the size in the women's group, $690,180.

As to workers employed, 40 per cent of the total establishments employed fewer than 100 persons each. There were 70 companies in this class, including 33 employing fewer than 50 persons. Fifty-six companies employed between 100 and 300 persons, 20 companies employed between 300 and 500 persons, 11 had between 500 and 1,000, and 6 concerns gave employment to more than 1,000 persons each. Thus, over three-fourths of the total number of concerns had a pay roll of fewer than 300 persons, and about 10 per cent of the total number gave employment to over 500 persons. The latter, however, account for about one-half of the employment reported for the whole group.

No general tendency is seen in this industry to establish branch plants. Only a few of the larger concerns report any branches, and these, with one or two exceptions, are located within New England.

SOURCES OF MATERIALS

In response to the inquiry as to the source from which their principal supplies were obtained, the number of concerns indicating New England as the source overshadowed the number indicating other sections of the country. Sources frequently mentioned outside New England were the Middle Atlantic States, centering in New York City, and the Middle West, while a small number mentioned foreign sources.

PLANT OPERATION

Additions to plant capacity since 1921 were reported by 20 per cent of the companies, ranging all the way from additions of 10 or 15 per cent to a doubling or tripling of capacity. In one instance the capacity was increased 600 per cent and in two others 300 per cent, while 8 establishments reported a 100 per cent increase. Most of the increases, however, ranged from 20 to 50 per cent and were commonest in the women's group; the men's group had nearly as high a proportion, while the general group showed the smallest proportion of increases. In general, these additions have been justified, as shown by corresponding increases in sales volume, although very few of the plants which reported additions indicated operations at maximum capacity in 1925. Reductions in plant capacity since 1921 were reported by 15 concerns, representing 8 per cent of the replies.

To determine the extent of utilization of available capacity in the New England shoe industry, the manufacturers were requested to state their 1925 output as a percentage of maximum 1925 capacity. Of the 162 companies replying to this question, 72 concerns, representing 44 per cent of the total number, stated operations at 75 to 100 per cent of the maximum capacity, and 34 of this number were at 90 per cent or above; 58 concerns, representing 42 per cent of the number, reported operations from 50 to 75 per cent of the possible output; while 22 concerns reported operations at less than one-half of their maximum capacity. Two-thirds of the companies reporting are included in the group operating between 50 and 90 per cent of full capacity. A great variation is noted between individual concerns, but there were no conclusive differences among manufacturers of different types.

LABOR AND EMPLOYMENT

One of the great difficulties in the shoe industry of New England is the high variation in activities at different seasons of the year. Between the months of maximum and minimum employment this industry in New England showed a variation in 1925 of 21.3 per cent in the average number of persons employed. This is much higher than the general average for the United States, which was 8 per cent. Peak employment in that year in New England was in the month of March, and September was the second highest month. The months of highest employment are in the spring, in February, March, and April. Employment falls off in the early summer, increases in August, September, and October, falls off again in November and December, and picks up in January. The month of lowest employment was June; for the United States as a whole the peak activity was in September, with very slight difference between the months of September, October, and March.

In general, New England shoe manufacturers have not succeeded in developing supplementary products to maintain uniformity of production, although in individual instances concerns have found successful ways of reducing the seasonal differences. In most cases the addition of supplementary products has been confined to shoes of a different type or grade with a different seasonal period of demand, or designed to reach a new class of customers. One manufacturer of women's shoes has obtained more uniform production by changing his selling methods; he stated that the retailer buys earlier and continues buying later than jobbers; he therefore aims to obtain more uniform production by selling to both distributors. Another manufacturer of women's shoes added a lower grade of shoes to his line. Several others make shoes for stock, during dull periods, of a type less subject to the effects of style changes. Another manufacturer added a medium-grade shoe, at the lowest possible price, regulated largely by low overhead and larger production.

Incentive methods of wage payment on a piecework basis have reached a relatively high development in the New England shoe industry. Among the concerns indicating their practice in this respect the average of percentages stated by individual concerns in the women's group was 86, while it was 70 in the men's group and 68 in the general. It is noteworthy that in the replies regarding the various forms of improvement which have been effected by shoe manufacturers, only 10 concerns indicated attention to better methods of wage payment. In 52 instances emphasis was placed upon the relation between management and workers, and in 30 instances upon the standardization of performance.

IMPROVEMENTS IN PRODUCTION

Among improvements in production indicated by manufacturers the greatest number emphasized production control and internal organization. Prevention of accidents comes in prominently. Among other improvements, numerous ones are emphasized in individual concerns, covering the continuous maintenance of plants, standardization of products, inspection of goods, the elimination of cancellations, and the balancing of producing capacity with demand. Development of purchasing schedules, uniform cost accounting, and correlation of production schedules with sales policy also come in for frequent attention.

Comments of individual companies indicating their success with various improvements are of interest in showing that a real effort is being made by many New England shoe manufacturers to improve internal conditions, with the result of increased profits or greater sales volumes. One manufacturer states, "Individual-drive motors on 60 per cent of our machines have lessened accidents and reduced power costs one-fourth. Standard types and leathers have allowed us to reduce our expense and increase our production with the same amount of help." Another concern states that standardization of products has given uniform production throughout the year, while in another instance continuous employment has been attained by making one standard type of slipper.

Another manufacturer states, "We have been somewhat successful in getting a standard shoe for the market, which has helped both sales and output." In one instance the employment of high-grade labor is credited with increased production and a better product. Improved quality of product is credited in another instance with the obtaining of a much better price.

In another instance a company reestablished its business on a smaller scale, thereby reducing overhead. It reports improved labor conditions, better deliveries, and fewer cancellations. Another company, by concentrating its activities in one plant, reports a reduction in its overhead burden by 40 per cent. Quick delivery of orders is mentioned in another instance as having prevented many cancellations, while increased turnover and elimination of outside financing are emphasized by another company.

SALES AND MARKETING

An analysis of the aggregate sales of these concerns from 1921 to 1925 was made in order to determine which type of company was progressing and which type receding. The aggregate sales of 116 companies, giving continuous figures from 1921 to 1925, with sales in the latter year totaling over $161,000,000, showed the slight increase of less than 1 per cent from 1921 to 1923, and a decrease of

12.5 per cent from 1923 to 1925, resulting in a net reduction, for the four years, of 12 per cent. A group of 29 companies among the manufacturers of men's shoes showed an increase of about 4 per cent in the 4-year period, but each of the other groups showed pronounced reductions. The aggregate sales figures for 149 companies, which gave data for 1923, 1924, and 1925, were as follows: For 1923, $192,562,000; for 1924, $177,179,000; and for 1925, $178,169,000. The sales in 1925 showed a decline of 7.5 per cent from those of 1923. All the reduction in the total took place in 1924; sales for 1925 showed a slight increase over the preceding year. Most of the decrease noted in the total figures was in the establishments manufacturing a general line of shoes, in which it amounted to 14 per cent from 1923 to 1925. In the group making slippers the decrease was 15 per cent, while in the two separate groups of men's manufactures and women's manufactures the decrease was less than 1 per cent.

The trends of individual sales of 120 companies which showed pronounced increases or decreases in 1925 were analyzed in detail. Of these concerns 55, with aggregate sales in 1925 of $103,836,000, showed individual decreases, and 65 companies, with sales of $64,724,000, showed increases. Among the concerns showing decreases were 6 companies with sales over $5,000,000 each, and 14 others with sales over $1,000,000 in 1925; those showing increases included 2 concerns with sales over $5,000,000 each, and 17 others with sales exceeding $1,000,000. The greater proportion of the decreases was in the group of general manufacturers, where 17 companies with aggregate 1925 sales of $64,610,000 showed a sharp falling off from 1923, and 11 companies with sales of $13,207,000 showed increases. The greater proportion of increases was in the men's group and the women's group. In the men's group 15 companies with sales of $18,068,000 showed decreases and 12 companies with sales of $25,276,000 had increases in 1925; while 19 companies in the women's group, with sales of $18,007,000 decreased, against 33 companies with sales of $23,028,000, which showed increases in 1925. In the slipper and infant's-wear group, 4 companies with sales of $3,151,000 showed decreases, while 9 companies with aggregate sales of $3,213,000 showed increases.

In the companies whose sales show increasing total volume the general reasons assigned are, in the order of importance: (1) Extension of territory, (2) new products, (3) new sales methods, (4) lower manufacturing costs. Some of the reasons as stated in comments of individual manufacturers are as follows: Addition of advertised line has increased sales; change in methods of merchandising by elimination of jobber whom we formerly sold entirely; development of own retail store chains; more salesmen who see customers oftener; greater efforts in sales-promotion work; more intensive selling and increased demand due to national advertising; large combinations buying through firm's Boston office; strengthening of position in competition and increased sales effort; old customers going out of business, 10 new ones added to replace lost accounts; selling lower-priced shoes; more demand for type of shoes (women's welt) manufactured by firm reporting; increase in lines available; successful meeting of competition due to improved product and low prices, made possible by lower costs and increased and improved production.

Among manufacturers whose total sales volume has been decreasing in the last few years the decrease was attributed most frequently to the general overproduction in the industry and to competition. These conditions, of course, are faced by all manufacturers.

In a finished article such as footwear, which is made ready for direct consumption, knowledge of its final markets and of the ways of reaching the markets is a matter of immediate importance to the manufacturer. Particular effort was given, therefore, to learn the localities in which New England manufacturers sell their shoe products, as well as the channels through which the goods are marketed, the extent to which individual manufacturers identify their product by brand or trade-mark, and the use of advertising mediums for reaching their market areas.

The product of New England shoe manufacturers is widely distributed throughout the country. Of 153 companies indicating the location of their sales, 80 per cent of them stated that their principal market was outside New England, and most of these sell less than 25 per cent of their output within that area. Among the remaining 20 per cent, whose principal sales are in New England, a small number sell all or nearly all of their output there. The Middle Atlantic States—particularly the great distribution center, New York City—provide the leading markets for the greatest number of companies, 76 of the total indicating this. One-half of this number indicated that their principal market was in the Middle West. In addition, 13 concerns have important markets in the Southern States, 4 others in the Southwest, and 4 in the States west of the Mississippi River. There were 46 companies claiming a nation-wide distribution of their products, and there were 7 selling principally on the Pacific coast. Foreign sales were reported in 20 instances. The general importance of these different market regions is the same for each type of footwear, whether men's, women's, or general.

The largest number of concerns stated that the principal sources of competition are within New England itself; next in importance are the near-by States of New York, New Jersey, and Pennsylvania, and this region is followed by the Middle West. It was apparent from the nature of these replies that many manufacturers are not sufficiently familiar with their market to know the sources of competition.

The trend of sales in the New England market in the last few years is found to vary with the type of product. Fifty per cent of the replies from manufacturers of men's shoes indicated increases in New England sales since 1921, while 50 per cent of those making women's shoes and 70 per cent of the general group indicated increases.

CHANNELS OF DISTRIBUTION

The prevailing single channel of distribution, as indicated by replies from 174 companies, is direct to the retailer or direct to the wholesaler and jobber. These two channels were indicated in approximately the same number of cases. In 4 instances sales were made entirely through the companies' own exclusive distributors, and in 1 instance to company stores, while in 2 other cases sales were made direct to the consumer. In no instance was sole dependence placed upon selling agents, and only a half dozen companies reported the use of this channel in conjunction with sales to the wholesaler or retailer. In most cases the manufacturer depends upon a single channel of distribution; 101 companies indicated this, while 73 reported the use of supplementary channels for a portion of their product. In 35 instances dependence was placed upon both the wholesaler and the retailer, and in 9 cases direct sales to retailer were supplemented by sales to the company stores.

USE OF TRADE-MARKS AND ADVERTISING

The use of trade-marks is by no means prevalent. Of 124 companies indicating the practice, 44 stated that they use a brand on a majority of their products, and 27 others use it on a portion amounting to less than one-half of their output, while 53 indicated no use of a trade-mark at all. The lack of trade-marks is more marked among the manufacturers of women's shoes than in the other classes. The average proportion sold under the manufacturer's own brand, for reporting companies in all groups, is approximately 36 per cent, and this applies to the concerns selling nationally as well as to the others.

Of 115 concerns which indicated their policy regarding the use of advertising, 63 per cent reported the use of national or local mediums, or both, and 44 per cent advertise nationally. The others reported no advertising. The percentages were highest among the concerns in the general group of manufacturers, which includes many of the larger companies that have national distribution. Approximately 12 per cent use local advertising. Of the mediums used, the one most commonly mentioned is the trade journal, which, of course, reaches the dealer rather than the consumer. Next in importance is direct mail advertising, which in numerous instances provides the only medium used. Dealer helps are also indicated in quite a number of cases. In addition to these, newspapers and magazines and direct mail advertising find occasional use. For the concerns which indicated the proportion of their net sales in 1925 spent for advertising, the average was 1.1 per cent, and that chargeable to selling costs amounted to 7.1 per cent.

EFFECT OF RECENT CHANGES

To show the effect of changes in market demands and in methods of distribution in the last few years upon the shoe-manufacturing industry, statements from a selected number of leading executives, giving their experiences and observations, are presented as direct quotations. Each of these points out some particular change with which the manufacturer has had to cope.

One manufacturer expresses a change in marketing methods thus:

> Changes in merchandising and buying during the last five years have been very radical. The policy of buying from hand to mouth has largely eliminated the jobber from our standpoint, so that our merchandising problem has very largely increased. Formerly all our trade was with the jobbers. Elimination of them has necessitated changing to direct selling to the retail trade, and all their buying is done on a hand-to-mouth basis.

This manufacturer has experienced slow payment of accounts and reports a high percentage of returned merchandise, bearing a 50 per cent loss, which was claimed to be the consequence of dealing directly with the retailer.

The executive of another concern explains the results of direct selling to retailers as follows:

> There has been a decided change in the past few years in the buying policy of retailers, who buy more from hand to mouth. This makes individual purchases much smaller and more frequent—probably a good thing for the retailer, but not quite as efficient for the manufacturer. Consumers now buy much more constantly throughout the year, since the character of the shoes, particularly in women's wear, does not vary greatly at different seasons, although there is naturally a little fluctuation at certain periods, such as Christmas and Easter.

The effect of changes in buying practices is stated thus by another executive:

> Our customers are buying much later in the season and are pursuing the hand-to-mouth policy. This increases the cost of manufacturing, as it eliminates practically two months each season of our productive period. In other words, the first two months of each season our production is very much below normal on account of our customers holding up the placing of orders until they are sure of their requirements. Under this policy we occasionally have to work overtime during the remaining four months. Our seasons are divided into two 6-month periods.

The effect of changes in the jobbing trade is indicated in this statement:

> Up to within three years our sales were practically confined to the jobbing trade, when orders were placed in the spring and fall for large quantities of merchandise. Competition has developed to such a point that to-day we believe no jobber is placing any large orders, but is buying from hand to mouth, putting a burden upon the factory in the matter of raw materials and market prices.

Another manufacturer states that in consequence of the repetition of small orders placed for immediate delivery almost continuous traveling is necessitated for his salesmen, which causes a tremendous additional cost on the marketing end. The effect of these marketing changes is thus emphasized in another instance:

> Some six or seven years ago we used to sell entirely to the jobbing trade. Conditions have so changed that we are obliged to sell now direct to the retailer; and because styles are continually changing, the successful retailer to-day is obliged to buy a wide variety of styles and a small quantity of each, and to buy much oftener than formerly. This necessitates calling on him about ten times a year, as against two or possibly four times in the past.

Another manufacturer states that the change from the old method of ordering in advance for future and seasonal delivery has eliminated much of the profit and has made necessary the carrying of a larger stock of materials in order to meet consumer's prices at time of delivery. In the cheaper grades of shoes, where an advance of a cent or two in cost of materials means a difference between profit or loss, this is particularly significant.

Besides these radical changes in merchandising methods, the changes in style and in consumers' preferences have had a great effect upon the manufacturer. One executive states, in this connection:

> We have found that, through steady growth of the demand for novelty footwear, staple shoes have been practically eliminated. This style situation has caused a marked speeding up of all phases of the shoe business, with a result that we are obliged to keep in much closer touch with our trade than ever before. This situation has also tended to cause the retirement of the so-called shoe jobbing houses to a very great extent, and in turn an increase in the chain-store outfits which purchase directly from the manufacturer and sell to the consumer.

From another executive comes the following:

> During the past five years we have changed from plain shoes, for which the orders were placed as a rule several months in advance of delivery, to a very big variety of patterns and styles, to meet a demand which calls for deliveries a few weeks from the time the orders are placed. To get a volume of business we are constantly changing patterns, even on the infants' shoes which we make, and our selling force is constantly on the go, visiting the trade. Our customers are buying just as close to their needs as they possibly can and have forced us to the promptest kind of delivery. We have found it necessary to equip our factory so that we can give just this kind of service.

The effect of these changes upon cost of materials and labor is thus pointed out by the executive of a concern making high-grade shoes:

> The changes which have taken place in consumer demand during the past 5 years are very extreme. Goods at greatly reduced prices are demanded, while the market for leather or labor has not changed to any extent. Manufacturers who wish to keep up production will be obliged to cheapen their product materially. For most manufacturers of the higher grade this will mean the use of inferior stock, which many manufacturers hesitate to employ. In our district * * * a mere trifle can be saved in labor. This means the use of high-priced labor and inferior materials, which make a shoe which never in the long run proves acceptable to the public.

The executive of another concern points out that the consumer demand has gone from the high-priced article of merchandise to low-priced goods, so that in his particular line the great demand is on price merchandise rather than on quality goods. He states that in consequence of the hand-to-mouth buying some very large concerns demand as short a time as two weeks' delivery on articles that have to be manufactured. In consequence of this situation there is underproduction, when these particular items are least in demand, and inability to produce in the seasons of high demand, thus creating an uneconomic condition for the manufacturers.

Another executive deals with the vital factors as follows:

> The principal change in consumer demand in the last 5 years has been the almost complete change on the consumer's part of wearing low-cut shoes the year round, which has done away with the distinct buying period we used to have. In the spring low-cut shoes were bought and worn until just after Labor Day; then these were sidetracked and high shoes were bought and worn until spring. On this account a great proportion of the shoes left over at the end of the season were never worn again when the season for those shoes came around, as they deteriorated upon standing and did not look as well as the owner expected when he got them out from his closet.
>
> Previous to 1920, our spring selling season, for instance, would open up about the middle of September, with salesmen going into all parts of the United States showing our line and booking orders for delivery from January to April, so that when our new factory season started, which would be about the 1st of December, we would usually have 2 to 3 months' work to start on and sometimes 4 months' and even more, according to conditions. This gave us

> a chance to plan our business and run it economically. Practically all the orders we take now are for immediate delivery. Sometimes we run for an entire season without having over a week's order ahead of us. This naturally has brought many complications, and at the best the factory can not be run economically.
>
> Besides these two reasons, there is overcapacity and overproduction, which make it necessary to sell our product at an extremely close price. This is bad enough, but could be endured if production were continuous through the year. On account of the hand-to-mouth buying and the doing away with the buying season, due to the continuous use of low-cut shoes, there comes a period twice a year when it is almost impossible to get business, and under to-day's conditions this means running full 8 months and running from 30 to 50 per cent for 4 months.

The comments of another executive, who discusses the subject from other angles, are presented to round out the picture. He points out that the shortening of women's skirts made the wearing of button or lace boots, 7 or 8 inches high, inconsistent with the new styles of dress, and that this cut into the heavy business which shoe factories formerly enjoyed from these high-cut shoes. The present conditions, with rapid sequence of style changes, cause uncertainty in the mind of retail shoe dealers as to what materials or styles of last or pattern in women's shoes will be salable a few weeks later, and, in consequence, the custom of placing liberal orders on two occasions in each year to cover anticipated needs for several months ahead has given way to a universal practice of hand-to-mouth buying. This practice has played havoc with the shoe factories, both in their sales department and in the manufacturing end. An insoluble problem was thus created for traveling men and for their houses, from the cost of visiting the trade twice as frequently as in former years. This executive discusses other phases of the situation thus:

> An outstanding feature of the situation has been the expansion of very large shoe-manufacturing concerns which make shoes of ordinary grade for the masses. On the other hand, these years have seen the rise and fall of innumerable small manufacturers operating with very little organization or overhead expense. They have made competition difficult for the old, well-organized houses. The chain-store system of retail dealers, with their mass buying, has injected another important element into the situation, affecting individual retailers with whom they compete and restricting the scope of solicitation by traveling salesmen for houses not privileged to sell the chain stores.
>
> Under the circumstances, the period under consideration has called for more or less adaptation on the part of old-line manufacturers. In our own case, we have put up a new building at our plant so as to make consolidation of the entire business, both production and administration, at the one plant. The very great resulting reduction in overhead expense will be helpful, as we seek to retain our fair share of current trade.

This manufacturer gives a side light on the style element thus:

> Another tendency of the past two or three years should be mentioned, namely, the remarkable revival of the use of McKay sewed shoes, to the disadvantage of welt and turned shoes of the better grades, which have always been the aristocrats in shoedom. Women have been so interested in the style element that a maximum of style and a minimum of cost has been the popular attitude of late. Quality of material and shoemaking have been to a certain extent disregarded, since no woman cares to buy a second pair of shoes just like the last pair; and, as a rule, she does not insist upon a very long wear of a shoe representing a transient style. This situation has tended to make certain factories busy and prosperous, while those whose product has always stood for conservative style and dependable quality have, in many instances, faced a quiet market.

SALES PLANS OF LEADING COMPANIES

The executives who made the foregoing statements regarding recent changes were asked also to outline their general sales plans, including the method of assigning territories, the means of analyzing their markets, and the organization of their selling force. From their replies the statements of 16 of these executives are presented as direct quotations, to show the practice among some of the progressive New England manufacturers.

1. "Our goods are sold by traveling salesmen, who cover all the medium and large sized towns throughout the country. We employ 34 salesmen, and they are assigned towns in contiguous territory, arranged for their convenience in railroad connections. We do not regard State lines, but make the territory oftentimes lie partly in two States, if the points can be more easily reached by this arrangement. As we manufacture only men's medium and high grade shoes, of course we can not visit the small crossroad stores, as their purchases would necessarily be too limited in amount to pay expenses. Salesmen are given a drawing account, with a final adjustment at the end of each season on a commission basis. We carry an 'in-stock department,' which has of late grown increasingly important and is generally used and appreciated by our trade. We are moderate advertisers in the national mediums, and we use these to interest our customers in local advertising. The striking feature in our line of goods in late years has been the success of some manufacturers who do extensive advertising at large costs, deducting this cost from the quality and value of their product. It has seemed to prove consistently that well-managed publicity at the present time is more profitable than well-managed factories. In other words, successful merchandising is more important than successful manufacturing."

2. "In our general sales plan we have traveling representatives, one of which is on the Pacific coast; one, with an office in Chicago, covering the Middle West; one, with an office in New York, covering New York State and going as far west as Pittsburgh and south as far as Baltimore and Washington. The rest of the country is taken care of from the home office. Our sales manager calls, for the most part, on the very largest trade, wherever it is situated. Salesmen all have a reasonable drawing account with a commission."

3. "Our general sales plan consists of a corps of salesmen covering cities and towns, and a stock department to cover small customers who could not buy in sufficient amount to warrant the visit of a salesman. Our salesmen are paid on a combination of salary and commission."

4. "We have 10 or 12 salesmen, all working on a commission basis, scattered all over the country, and with one exception they are carrying our line in connection with a noncompeting line."

5. "We have 12 traveling salesmen who are paid on a commission basis. We try to give each man a sufficiently profitable area so that commissions may take care of the cost of travel as well as of support for himself and family. However, the traveling man's lot is not an enviable one nowadays, and his financial reward fluctuates with wind and weather and with general and local trade conditions. It is our custom to carry in stock at the factory about 75 different kinds of shoes, in order that instant service may be given the retailers who constitute our clientele, when they favor our salesmen or the house direct with a substantial order."

6. "Our general sales plan is to have salesmen in different localities of the country where our merchandise is in demand. We have eight such salesmen, the larger part of whom are selling entirely on a commission basis."

7. "Our sales efforts are with the jobbers. We have five salesmen on straight salary basis who see the trade in the larger centers about every six weeks. We haven't any new or spectacular methods, but believe in the policy of active and frequent solicitation of the trade by salesmen of character, and with ability to give helpful service to the buyer."

8. "About the only general sales plan that we have is that of first making the best merchandise we know how to make, on up-to-date styles, which enables us to sell the most desirable account. We have no salesmen, the writer with another executive of this office at the present time selling most of our merchandise."

9. "Up to 18 months ago this firm sold the jobbing trade almost exclusively, but owing to the fast liquidation of the shoe jobbers we have been forced to solicit the retail trade direct. At the present time about 60 per cent of our output is sold direct to the retailer. We have eight traveling men who work on guarantee plus expenses, the sum of which is dependent on a commission figured on their gross sales. The territories are arbitrarily assigned by us."

10. "We manufacture infants' shoes exclusively, and our merchandise is distributed through the jobbing and mail-order trade. One man, who is a member of our firm, sells practically all of our merchandise, having as assistant a young man who works on a salary. We find that this method reduces selling cost to a minimum. Our merchandise is made in 72-pair units only, and we solicit business only from people who distribute in large volume. The margin of profit necessarily is very small per pair, but we have been able to operate successfully on account of the volume of business which the policies followed have enabled us to get."

11. "We sell our goods direct to the retail trade by traveling salesmen, of whom we have nine. The territory is so arranged that we cover practically the whole of the United States. These men travel wholly on commission."

12. "The owners of this business sell to the wholesale and chain-store trade. Salesmen work on commission, selling the small retail trade out of stock. This latter is a new policy with us, as we formerly sold only the wholesale and chain-store trade."

13. "We sell the retail trade but solicit business only from the larger dealers and chain stores. We carry about five salesmen, working on a commission basis."

14. "A large part of our product is sold through chain-store distribution. The balance of it is sold through mail-order houses and jobbers. We used to market about one-third of our output through retailers, but with the change in the policy of buying, together with the very short line which we carry, it did not pay to solicit this trade, which must be served by concerns carrying a much longer line. Also, the large family stores that used to give us the larger orders on our particular line have been either eliminated or forced into more of a specialty business by chain-store competition."

15. "We sell to the wholesale trade, to mail-order houses, to large department stores, and to chain stores. We have five salesmen, who are all paid a stipulated salary. Each salesman covers the territory which has been assigned to him."

16. "Our present sales policy is to sell direct to the consumer through our own chain stores. Such extra business as we need is obtained by having part of the organization in our factory go direct to large purchasers, cutting out entirely the expense and detail ordinarily connected with a sales organization."

Numerous instances were found among the replies of the general group of manufacturers' replies where consolidation of selling activities had been undertaken along with the consolidation of manufacturing, resulting in a reduction in the unit cost of manufacturing and of marketing. Approximately 75 per cent of the concerns indicated plans for emphasizing sales and marketing methods, and only a slightly smaller number signified the intention of stressing better management. The replies, as a whole, indicate an encouraging tendency on the part of New England shoe manufacturers to appreciate the major importance of merchandising methods adapted to recent changes in their markets, and not to lose sight of necessary adjustments in management and organization for the effective application of new methods of merchandising.

BOOT AND SHOE ACCESSORIES

In connection with shoe manufacture there are two branches closely related to it which contribute an important part to New England industry. These are (1) the making of cut stock from leather and other material, and (2) the preparation of various other parts, linings, and trimmings, which go under the general name of shoe findings. The product of these two lines in 1927 had a value not far from $90,000,000 and brought a revenue of some $26,500,000 to the three States, Massachusetts, New Hampshire, and Maine.

CUT STOCK

In the making of cut stock, which includes soles and leather heels, insoles, counters, and top lifts, which are made for sale by establishments other than shoe factories, there were in 1925 over 3,000 persons engaged in 183 establishments of various sizes. These establishments gave employment to some 2,500 wage earners, who received $2,837,000 in wages, and added about $8,250,000 to the New England revenue. This industry provided a market for materials which involved an outlay of more than $27,000,000. The output of these three States in cut stock was 42 per cent of the United States total. As in shoe manufacture, Massachusetts dominates this industry, with over 99 per cent of the New England output; the output of 7 establishments in New Hampshire and 4 in Maine together was less than $700,000 in 1925.

A substantial increase in this activity is noted in 1927, when the value of the output in Massachusetts was about $16,000,000 greater than in 1925, with an increase in net revenue of more than $2,000,000. There was a considerable increase in wage earners and in total wages paid, although there was quite a reduction in the number of establishments reported by the census in the latter year.

BOOT AND SHOE CUT STOCK IN NEW ENGLAND STATES

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:							
1927	140	----------	2,606	3,008	40,258	50,648	10,390
1925	171	2,976	2,374	2,722	26,843	34,854	8,011
New Hampshire: 1925	7	102	83	73	295	431	137
Maine: 1925	4	60	53	41	166	266	100
Total (3 States) 1925 [1]	182	3,138	2,510	2,837	27,304	35,551	8,248
New England:							
1914 [2]	184	----------	3,808	2,044	30,495	35,758	5,263
1904	238	----------	4,598	1,896	17,047	21,892	4,845
United States: 1925	244	8,468	7,197	7,978	65,646	84,220	18,574
New England as per cent of United States, 1925	74.6	37.1	34.9	35.6	41.6	42.2	44.4

[1] There was 1 establishment in Connecticut in 1925.
[2] There were 5 establishments in New Hampshire.

BOOT AND SHOE FINDINGS

The manufacture of boot and shoe findings, from the standpoint of net revenue and of employment, is about twice as important as that of cut stock, and it is more widely distributed in New England. Activity in this line also shows a substantial growth since 1925, the value of the output increasing by nearly $3,000,000 and the net revenue therefrom by more than $1,000,000. In number of establishments there was an increase of 17 in Massachusetts and 8 in New Hampshire, with a net increase of 600 wage earners in the three States, Massachusetts, New Hampshire, and Maine.

In 1925 there were 250 establishments of various sizes making boot and shoe findings in these three States, engaging the activities of 6,400 persons, adding about $15,000,000 to the region's revenue, paying in wages upward of $6,000,000 to 5,390 workers, and providing a market for purchased materials exceeding $20,000,000. The following table shows the importance of this industry in the individual States, with comparative figures for 1914 and 1904. Massachusetts is credited with 89 per cent, New Hampshire with 8 per cent, and Maine with 3 per cent of the 1925 production for these three New England States. Outside these States there were 3 establishments in Connecticut and 2 each in Rhode Island and Vermont for which no figures are available. The New England States stand out in the national total for shoe findings, with two-thirds of the entire output.

Boot and Shoe Findings in New England States, 1925 and 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars: Wages	Thousands of dollars: Cost of materials	Thousands of dollars: Value of products	Thousands of dollars: Value added by manufacture
Massachusetts:							
1927	253	----------	5, 157	5, 822	19, 868	33, 476	13, 608
1925	236	5, 533	4, 617	5, 273	18, 170	31, 223	13, 054
New Hampshire:							
1927	17	----------	572	596	1, 840	3, 532	1, 692
1925	9	529	471	448	1, 609	2, 912	1, 304
Maine:							
1927	5	----------	264	238	423	1, 132	709
1925	5	337	302	325	433	1, 074	641
Total: [1]							
1927	275	----------	5, 993	6, 656	22, 131	38, 140	16, 009
1925	250	6, 399	5, 390	6, 046	20, 211	35, 210	14, 998
New England:							
1914 [2]	245	----------	4, 533	2, 317	13, 712	19, 394	5, 682
1904 [3]	171	----------	3, 485	1, 310	5, 466	8, 270	2, 804
United States:							
1927	379	11, 739	9, 950	11, 202	31, 862	57, 433	25, 571
1925	326	10, 076	8, 605	9, 695	29, 248	52, 064	22, 815
New England as per cent of United States, 1925	76. 7	63. 5	62. 6	62. 4	69. 1	67. 6	66. 0

[1] Exclusive of 3 establishments in Connecticut, 2 in Rhode Island, and 2 in Vermont.
[2] Exclusive of 1 establishment in Connecticut, 3 in Rhode Island, and 11 in New Hampshire.
[3] Exclusive of 1 establishment in Connecticut.

DEPENDENCE UPON SHOE MANUFACTURING

These two industries, boot and shoe findings and cut stock, are a natural accompaniment of the shoe-manufacturing industry, and they find the market for their products in the shoe factories of New England. The proximity of this market is the chief reason for their development in these States. The raw materials needed are in large measure easily accessible from the Boston leather market. Leather, particularly sole leather, is the main article used for making cut stock, and a majority of the manufacturers buy all or the greater part of their leather supplies in the New England market. In making shoe findings the principal raw materials are leather, leather board, and cotton goods. These, likewise, are purchased mainly within New England, although some fiber board comes from outside sources. Miscellaneous decorative materials, such as ribbons, satins, velvets, beads, buckles, rhinestones, felt, gums, and waxes, for fabricating are used also by individual concerns.

CONDITIONS IN THE INDUSTRY

Conditions within these industries naturally run parallel to those in shoe manufacturing, and the changes in recent years are reflected by similar changes in these accessory lines of manufacture. Special information regarding conditions of production and marketing in the past few years was obtained from 35 manufacturers of cut stock, having aggregate sales in 1925 of $16,253,000 and employing an average of 1,000 persons, and from 42 manufacturers of shoe findings having aggregate sales exceeding $14,000,000 and representing 40 per cent of the total 1925 output. The replies represented 46 per cent of the region's total output of cut stock and 40 per cent of the employment.

In these representative groups of manufacturers the average sales of individual establishments making cut stock in 1925 were $464,400, and the average number of persons employed was 29. In the group of 35 cut-stock manufacturers there were 11 companies whose individual sales exceeded $500,000 each, and these accounted for two-thirds of the reported total sales; while there were 22 companies with sales under $500,000 each, employing fewer than 25 workers, which accounted for only one-third of the total volume. The output in relation to maximum capacity in 1925 for 29 companies which gave sales figures aggregating $15,000,000 in the cut-stock group was 83 per cent. There were only 4 establishments which reported running at maximum capacity, and likewise 4 concerns operating at less than one-half of capacity.

The sales trends of 33 concerns in this cut-stock group showed a marked downward movement in the aggregate since 1922, with a slight upward movement in 1925. Despite this general decline in totals, however, one-half of these concerns increased their sales volume during this period—several of them to a pronounced degree. The sales of three of the large companies, exceeding $1,000,000 each, showed a pronounced decline, while the sales of two other large companies increased.

Decreases in New England sales of cut stock were generally attributed to a falling off in demand and to consequent price reductions. One manufacturer stated that competition and price cutting had driven prices below a point where any profit could be made. The poor credit standing of some customers was mentioned as a difficulty by another manufacturer. Among the causes of the reduced demand for leather cut stock was mentioned the substitution of wooden heels and fiber soles.

The sales trends and conditions in shoe findings run generally parallel to those of shoe manufacturing, showing a sharp falling off in 1924, with nearly complete recovery in 1925. In this period approximately the same number of companies showed increases as showed decreases. Four large concerns, with sales exceeding $1,000,000 each, showed a considerable recession in volume of sales; while a large welt-manufacturing concern, which exported a considerable portion of its output, showed substantial growth.

In the shoe-findings group the size of reporting establishments showed a lower average in sales per company ($361,500) than the cut-stock group, but the average employment (54) in shoe findings was more than twice as great. Of the 42 manufacturers reporting for shoe findings, two-thirds had individual sales below $250,000 and employment of fewer than 50 persons each, but these accounted for less than one-fourth of the total employment. There were 17 concerns with sales of less than $100,000. Four-fifths of the total number, whose individual sales were below $500,000 each, accounted for only one-third of the total sales; while the 5 establishments with sales exceeding $1,000,000 each, accounted for 57 per cent of the total.

According to the firms reporting, manufacturers of shoe findings show a tendency to establish branches for making the different types of articles which they sell, while no such tendency is observed in the manufacture of cut stocks. Eight concerns in the former group reported the operation of branch plants in or near the important shoe-manufacturing centers. In three cases these branches were located outside New England, in cities of Ohio and Wisconsin, and in Brooklyn, N. Y.

MARKETS

The majority of sales by these manufacturers of cut stock and of findings were reported to be made in New England. Of 34 makers of cut stock, 27 reported one-half or more of their product sold in New England, and 14 of these concerns sold from 75 to 90 per cent, and 7 sold their entire output in that section. Of the 43 manufacturers of shoe findings, all but 5 reported sales of one-half or more of their output in the New England market, 27 of them selling 75 per cent or above, and 10 of these marketing all their output in those States. Sales outside New England were reported chiefly in the shoe-manufacturing sections of the Middle Atlantic States, especially New York, and in the Middle West.

In regard to exports there is quite a contrast in these two groups. Fourteen concerns in the shoe-findings group indicated foreign sales, ranging in most cases from 1 to 3 per cent of their 1925 output. A large manufacturer of weltings reported exports of 12 per cent, and a medium-sized manufacturer of shank board exported 10 per cent of his output. On the other hand, only 4 manufacturers of cut stock indicated exports. One concern with sales of $1,500,000, and another with sales of $500,000, exported 5 per cent of the output. A $1,500,000 concern reported exports of 1½ per cent; and a $500,000 concern had foreign sales of less than 1 per cent of the total.

The principal channels of distribution in these two lines run directly to the shoe manufacturers or to wholesale dealers; the majority of companies reported selling their entire output direct to the manufacturers, while a few sold to wholesaler or jobber only. Commission agents play a very slight part in the marketing of cut stocks, but they appear to be relied upon to quite an extent, in conjunction with other channels, by the reporting manufacturers of findings.

USE OF ADVERTISING AND TRADE-MARKS

The majority of the cut-stock manufacturers indicated that they back up their marketing program by advertising, in which the trade journal and direct mail are the principal mediums. Only a small proportion of the manufacturers of findings, however, indicated the use of advertising.

The use of trade-marks on the product appears general, but there was a considerable number of concerns in each group which indicated no use of a special brand to identify their output. In some cases the nature of the product makes the use of a trade-mark impracticable.

CHANGES AND IMPROVEMENTS

Among the manufacturers of shoe findings whose business had increased, the larger number credited this increase to the extension of sales territory, particularly in the shoe-manufacturing sections outside New England. A manufacturer of specialty soles and shoe bottoms, whose sales volume increased from $200,000 to $600,000 since 1923, stated that careful studies were made with a view to manufacturing a kind of product desired by the ultimate consumer. In the case of another concern an increase in New England business was credited to specialization in the particular type of shoe trimmings desired by New England shoe manufacturers. One of the companies, whose total volume had increased 100 per cent since 1923, attributed the gain to an improvement in general business conditions, while another prospering manufacturer in this group spoke optimistically of the return of New England as the logical shoe center of the world. In another instance, a manufacturer stated that although many old concerns have been going out of business he has been successful in obtaining new accounts to replace those that were lost.

In contrast to this attitude, a demand for cheaper material, which the New England manufacturer could not meet, was indicated by a maker of insole materials, heel pads, and box toes. One manufacturer, who has steadily maintained his New England business, stated that this business has been held on the basis of quality. In many cases the falling off in the markets for cut stock was attributed to general overproduction, while a number considered a change in demand, such as the falling off in the use of sole leather in repairing shoes, as the underlying cause. In this connection one large manufacturer held that a revolution has been brought about in the cut-stock industry through the entry of packing-house tanneries into the cut-sole and leather industry and the combination of very large units in shoe manufacturing who do their own tanning and cutting of leather, with the resulting elimination of the smaller shoe manufacturers.

MISCELLANEOUS LEATHER MANUFACTURES

In addition to the major products of the leather industry, which have been analyzed in some detail, there are several smaller lines of some importance in the New England total. These include the manufacture of leather belting, trunks, suit cases and bags, purses and cardcases, saddlery and harness, and various unclassified leather goods. There were 115 of these establishments in Massachusetts and Connecticut in 1927 for which census figures are available, besides a number not reported. The total reported output of these in 1927 amounted to about $14,000,000, giving employment to 2,158 wage earners, providing a market for nearly $8,000,000 worth of materials, and adding upward of $6,000,000 to the revenue of these two States. Most of this production was in the State of Massachusetts.

Leather belting is the principal item in this miscellaneous group, while trunks, suit cases and bags, and other leather products had an aggregate importance exceeding considerably that of belting. The importance of these activities is indicated in the following tables.

MISCELLANEOUS LEATHER MANUFACTURES[1] IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Persons engaged	Wage earners	Thousands of dollars			
				Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:							
1927	99	----------	1,932	2,095	7,304	12,871	5,566
1925	105	2,338	1,958	2,098	7,721	13,545	5,824
Connecticut:							
1927	16	----------	226	205	537	1,192	655
1925	8	266	238	218	725	1,317	592
Total:							
1927	115	----------	2,158	2,300	7,841	14,063	6,221
1925 [2]	113	2,604	2,196	2,316	8,446	14,862	6,416

[1] Includes belting, trunks and bags, pocketbooks, saddlery and harness, other leather goods.
[2] Not including 10 establishments in Connecticut.

MANUFACTURE OF LEATHER BELTING IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	20	384	535,243	3,520	5,211	----------
1925	18	664	780	4,844	7,335	2,490
Connecticut, 1927	6	40	35,472	155	283	128
Rhode Island, 1925	4	14	28	96	181	85
Massachusetts and Connecticut, 1927	26	424	570,715	3,675	5,494	1,819
Massachusetts and Rhode Island:						
1925 [1]	22	678	808	4,940	7,516	2,575
1914 [2]	24	1,132	776	5,071	7,428	2,357
United States:						
1927	173	2,164	2,925	16,185	27,266	11,080
1925	168	2,644	3,505	18,868	31,811	12,943

[1] Not including Connecticut, 7 establishments, Maine 1, New Hampshire 1.
[2] Not including Connecticut, 3 establishments, Maine 1, New Hampshire 1.

MANUFACTURE OF TRUNKS, SUITCASES, AND BAGS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	24	418	477	1,100	2,333	1,232
1925	28	578	656	1,476	2,977	1,501
1914	25	377	224	650	1,138	488
1904	13	266	131	396	721	325
United States:						
1927	495	10,345	13,085	29,128	59,959	30,830
1925	475	10,348	13,226	31,382	61,224	29,842

These lines have experienced the general changes which have affected the markets for leather products, in which the use of materials other than leather has had a pronounced influence. The market for leather belting has been greatly curtailed by the widespread installation of electric motors in manufacturing plants, which has done away with the use of belts in the transmission of power. The use of woven belting has also cut heavily into the demand for leather belting. The market for harness, which was formerly an important New England product, has been decimated in consequence of the widespread replacement of the horse by the automobile and the tractor.

RUBBER MANUFACTURES

The rubber industries of the United States had their birth and early development in New England. Despite the expansion in the tire industry in other sections nearer the centers of automobile manufacture, New England continues to make a very substantial contribution to the national production of rubber articles. New England manufacturers at the present time supply the major portion of the Nation's rubber footwear, and a large part of the rubber clothing, belting, as well as hose, and rubber articles used in the druggist trade.

The industry as a whole in New England gives employment to nearly 30,000 wage earners, and contributes to the revenue of these States nearly $100,000,000 annually, as shown by the value added by manufacture. As a consumer of raw materials, including fuel, power, and supplies used in manufacture, this industry provided a market amounting in 1927 to more than $100,000,000. Altogether there are upward of 100 New England establishments engaged in the manufacture of rubber products. Of this number Massachusetts in 1927 had 74 manufacturing plants; Connecticut followed with 23, and Rhode Island with 11. (See fig. 42.)

TYPES OF PRODUCTS

The rubber industries include three distinct types of products. From a national standpoint the most important of these in New England is the manufacture of rubber footwear. New England contributed in 1925 more than two-thirds of the income of the entire country from the manufacture of rubber boots and shoes. In this branch of the industry there were 10 Massachusetts establishments whose contribution to the State's manufacturing revenue in 1927 amounted to nearly $37,500,000. There were also 4 establishments in Connecticut and 4 in Rhode Island in this line for which no production figures are available.

In the manufacture of other rubber goods, exclusive of automobile tires, there were all together 84 New England establishments. Of this number 62 were in Massachusetts, 15 in Connecticut, and 7 in Rhode Island. Separate New England totals for rubber goods can not be given because the data for Massachusetts include rubber goods and tires together. In Connecticut there were 15 establishments making miscellaneous rubber goods exclusive of tires, whose activities contributed $18,500,000 to the manufacturing revenue of the State, and in Rhode Island there were 7 establishments in this class which contributed $9,600,000 to the State's manufacturing revenue.

In the manufacture of rubber tires and inner tubes there were six New England establishments in 1927. Four of these were located in Connecticut and two were in Massachusetts. The Connecticut production in that year contributed upward of $15,000,000 to the State's manufacturing revenue. The principal centers of tire manufacture are Cambridge, Hartford, and Norwalk.

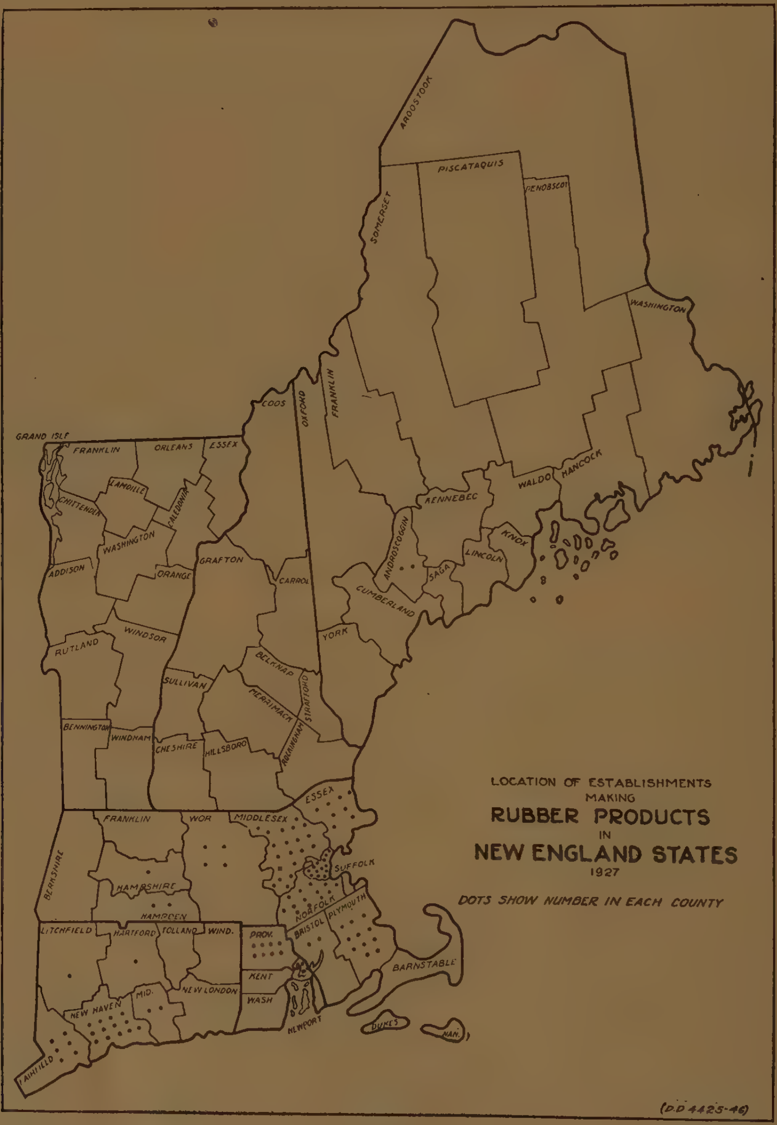

LOCATION OF ESTABLISHMENTS
MAKING
RUBBER PRODUCTS
IN
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
KENNEBEC
WALDO
HANCOCK
ANDROSCOGGIN
KNOX
LINCOLN
SAGA
CUMBERLAND
YORK
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR
MIDDLESEX
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH
NEW LONDON
MID.
NEW HAVEN
FAIRFIELD
NEWPORT
BARNSTABLE
DUKES
NAN.
(D.D 4425-46)

Figure 42

Census figures for the different classes of rubber manufacture in the New England States, as far as they are available, are given for 1927 and 1925 in the following table.

RUBBER MANUFACTURES IN NEW ENGLAND STATES, BY CLASSES OF PRODUCTS, 1927 AND 1925

Product and State	Establishments	Wage earners	Thousands of dollars: Wages	Cost of materials	Value of products	Value added by manufacture
MASSACHUSETTS						
Tires and inner tubes and rubber goods, n. e. c.:						
1927	64	10, 364	13, 298	56, 716	97, 718	41, 002
1925	52	10, 740	13, 904	61, 611	108, 595	46, 983
Rubber boots and shoes:						
1927	10	12, 081	15, 471	18, 957	56, 440	37, 483
1925	10	11, 389	13, 525	18, 794	53, 626	34, 832
Total:						
1927	74	22, 445	28, 769	75, 673	154, 158	78, 485
1925	62	22, 129	27, 430	80, 406	162, 221	81, 814
CONNECTICUT						
Tires and inner tubes:						
1927	4	1, 505	2, 185	10, 166	15, 091	4, 925
1925	5	----------	----------	----------	----------	----------
Rubber goods, n. e. c.:						
1927	15	2, 914	3, 532	9, 906	18, 500	8, 594
1925	15	2, 496	2, 979	8, 691	15, 296	6, 604
Rubber boots and shoes: 1925	4	----------	----------	----------	----------	----------
RHODE ISLAND						
Rubber goods, n. e. c.:						
1927	7	2, 044	1, 907	4, 769	9, 606	4, 837
1925	5	2, 130	2, 979	8, 691	15, 296	6, 604
Rubber boots and shoes: 1925	4	----------	----------	----------	----------	----------

NOTE.—The abbreviation n. e. c. means "not elsewhere classified."

TRENDS IN NEW ENGLAND

Comparison of available figures indicates that in the manufacture of rubber boots and shoes and of rubber goods other than tires New England has fully held its own since 1925. In rubber boots and shoes in Massachusetts there was an increase in manufacturing revenue in 1927 of $2,650,000, and a substantial increase in employment, although there was no change in the number of plants. In the making of miscellaneous rubber goods Connecticut shows no change in the number of establishments, but a substantial increase amounting to nearly $2,000,000 in manufacturing revenue. In Rhode Island there was a reduction of two in the number of rubber-goods establishments, accompanied by considerable falling off in revenue.

Comparison of figures for 1925 with those for 1914 indicates that in the manufacture of rubber boots and shoes the increase in New England during this 11-year interval was substantially greater than in other sections. New England manufacturing revenue in 1925 was nearly 300 per cent greater than that in 1914. For the country as a whole the increase was but slightly over 150 per cent. New England appears to have made very substantial advances also in the manufacture of rubber goods such as druggists' goods, rubber brushes, rubber clothing, belting, and hose.

MANUFACTURING CONDITIONS

Replies from a representative number of New England manufacturers indicate that there has been considerable change in the type of products manufactured. For example, one manufacturer stated that he had discontinued the production of rubber clothing in favor of rubber footwear. Another, who formerly made footwear as a side line, now has this as a principal product. In another case a concern which made rubber boots and shoes exclusively has turned principally to specialties, such as rubber heels and soles. Several other concerns report the changing from rubber sundries and clothing to footwear.

There are a number of branch plants of large companies which have in recent years assumed control of New England establishments already in operation. Some of these companies have their headquarters outside New England, but they follow the policy of continuing to operate these establishments as an important part of their manufacturing activities. Within the rubber industries it is significant that there has been extensive development of piecework and other incentive methods of wage payment.

Efforts to overcome seasonal variations in employment were reported in numerous cases by adapting the product or adding new products to appeal to a broader market. Several concerns reported exhaustive studies of market conditions in order to balance their production with periods of demand for rubber goods. Substantial advances appear to have been made in this industry in the development of market research.

The majority of sales reported in this line were made outside New England, and many concerns cater to a nation-wide market. Raw materials reported by most of the concerns consist of rubber, various fabrics, and chemicals. These were said to be purchased, in the majority of cases, from sources outside New England.

PAPER AND PAPER PRODUCTS

The making of wood pulp, paper, and paper products is among the leading industrial activities of New England, ranking sixth in importance as a source of revenue and fourth in the gross value of its output. The paper industries are of particular importance to this section because their raw material comes in large measure from the native resources of New England; and they are of national importance because of their large contribution to the country's paper requirements.

PRODUCING REGIONS

There are three regions in the New England States where paper manufacture is an important industry. The most extensive one of these is in the northern part, adjacent to the supplies of pulpwood from the forests of northern Maine, New Hampshire, and Vermont. In Maine most of the paper mills are along the Kennebec, Penobscot, and St. John Rivers. Large paper mills are located at Millinocket, Orono, Old Town, and Brewer, in the Penobscot Valley, also in Waterville and Rumford, and in Madawaska on the St. John River. There are several other Maine towns where paper making is important. Berlin, in northern New Hampshire, is the great paper-producing center of that State, and there are mills of lesser size in other parts of New Hampshire's forested area. These northern New England mills, for the most part, manufacture their pulp direct from the wood produced in their locality.

The second important paper-producing section is in the Connecticut River Valley of Massachusetts, with Holyoke as its center. This is the principal section of the country in the manufacture of high-grade bond and other rag papers, and Holyoke is known far and wide as the "paper city." In the Thames River Valley of eastern Connecticut there is an area north of New London, centering in Montville, where paper manufacture has long been an important industry. In this region most of the raw material is shipped in in the form of wood pulp and other material for box boards.

Besides these principal paper areas of New England there are numerous cities and villages with establishments which make various products from purchased pulp and paper materials. The greatest number of these establishments are engaged in making boxes and other containers, but a considerable number of factories make a wide variety of commercial paper products.

In the location of paper factories in New England the big factors are (*a*) a supply of raw materials, (*b*) abundant power, and (*c*) large quantities of water for the manufacturing processes. These factors have a happy combination in this section, especially in northern New England, with near-by supplies of pulpwood from its forests, clear water, and a combination of water power and streams for floating the pulpwood from the forests to the mill. The great paper mills are located where this combination is present, with transportation for their pulpwood provided by the forest streams, large supplies of water for processing, and water power to meet the large requirements for driving machinery. The paper mills require also a considerable tonnage of coal to provide heat for drying processes,

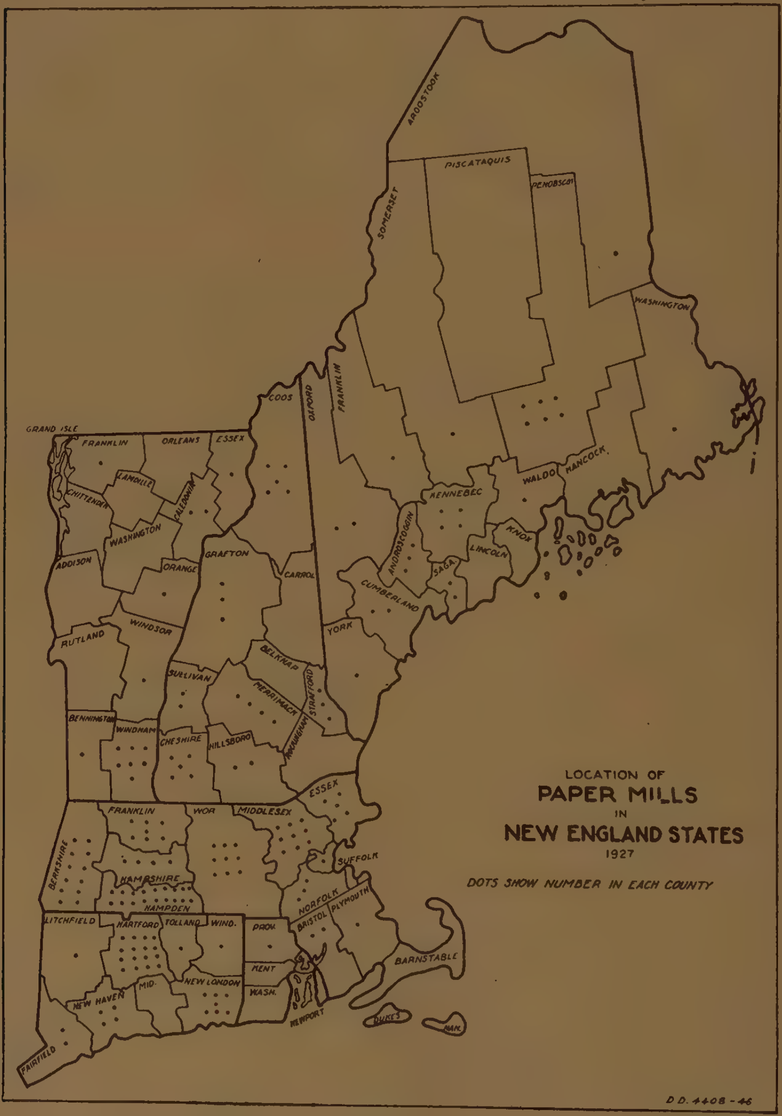

LOCATION OF
PAPER MILLS
IN
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
KENNEBEC
WALDO
HANCOCK
KNOX
LINCOLN
ANDROSCOGGIN
SAGA.
CUMBERLAND
YORK
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ROCKINGHAM
ESSEX
FRANKLIN
WOR
MIDDLESEX
BERKSHIRE
HAMPSHIRE
SUFFOLK
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
KENT
WASH.
NEWPORT
BARNSTABLE
DUKES
NAN.
NEW LONDON
MID.
NEW HAVEN
FAIRFIELD
D.D. 4408-46

Figure 43

and, in some cases, to supplement an inadequate supply of water power. (See fig. 43.)

In converting paper and making paper products the factors of power and of labor are both important. Development of these secondary paper industries in New England has been fostered to a considerable extent by the near-by markets for their products, afforded by other industries in this section. This applies particularly to box boards and to boxes and other containers made from paper and pulp. The printing and publishing industry in New England and other near-by centers provides a substantial market for printing paper and book paper.

TYPES OF MANUFACTURE

The paper industries are classed here as of two distinct types of manufacture. The first has to do with the manufacture of paper from wood pulp, rags, or other raw materials in paper mills, while a second class is concerned with the further manufacture or finishing of paper outside the mills where it is made. Because of the fact that this second class of manufactures uses the products of the first class as raw material, there is considerable duplication in the figures for total value of product and cost of materials. The value added by manufacture is, therefore, a much more accurate indication of the importance of the second group. There is also considerable overlapping in the primary manufacture of paper and the making of paper products, because many mills, especially the larger ones, make finished products, such as bags, boxes, cartons, and other articles ready for consumption, in addition to pulp and paper.

In the primary manufacture of paper and wood pulp from wood and other raw materials there has been considerable reduction in output and activity in the last few years, as shown by the comparative census figures for 1927 and 1925. Paper boxes and other fiber containers, however, showed little change in the 2-year period. Factories making miscellaneous paper goods, envelopes, and boxes, on the other hand, increased materially in the value of their output and in the manufacturing revenue, as shown in the value added by manufacture. The approximate importance of the principal classes of paper manufacture in New England, as far as can be shown by available census data for 1927 and 1925, is presented in the next table. These figures are not complete because of the omission of various establishments in the individual items; hence in making comparisons among the different items and years account should be taken of the omissions mentioned in the footnotes.

PRINCIPAL PAPER INDUSTRIES IN NEW ENGLAND STATES, 1925 AND 1927

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Paper and wood pulp:						
1927 [1]	175	25, 626	33, 883	136, 194	229, 172	92, 979
1925 [2]	199	33, 136	42, 920	151, 848	250, 665	98, 817
Boxes, paper, and other fiber:						
1927 [3]	191	8, 302	8, 079	18, 412	36, 105	17, 693
1925 [4]	198	8, 364	7, 917	15, 364	33, 251	17, 888

[1] Excluding Rhode Island.
[2] Exclusive of 1 establishment in Rhode Island.
[3] Excluding Vermont.
[4] Exclusive of 3 establishments in Vermont.

PRINCIPAL PAPER INDUSTRIES IN NEW ENGLAND STATES, 1925 AND 1927—Contd.

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Miscellaneous paper goods:						
1927 [5]	74	2,644	3,118	14,062	23,155	9,093
1925 [6]	69	2,487	2,915	12,393	20,839	8,445
Envelopes:						
1927 [7]	17	2,228	2,490	7,869	13,876	6,007
1925	16	2,027	2,220	6,687	11,924	5,237
Bags, not made in paper mills:						
1927 [8]	4	203	209	1,629	2,222	594
1925 [9]	4	166	154	851	1,230	379
Total:						
1927	461	39,003	47,780	178,165	304,531	126,366
1925 [10]	485	46,180	56,126	187,143	317,909	130,766

[5] Excluding New Hampshire and Maine.
[6] Exclusive of 3 establishments in New Hampshire and 1 in Maine.
[7] Massachusetts only.
[8] Excludes all New England States but Massachusetts.
[9] Exclusive of 1 establishment in Connecticut and 1 in Maine.
[10] Other items not included for 1925 are (*a*) labels and tags: Massachusetts 6, Rhode Island 3, New Hampshire 1; (*b*) card cutting: Massachusetts 3, Rhode Island 2; (*c*) cardboard: Massachusetts 2, Rhode Island 1.

PRIMARY PAPER MANUFACTURE

Approximately two-thirds of the total activity in the New England paper industries is represented by paper mills engaged in the primary manufacture of paper from wood pulp, rags, and minor materials. In New England, exclusive of Rhode Island, there were 175 establishments of this sort in 1927, whose product had a value exceeding $229,000,000. Their contribution to the revenue of the region, as shown in the value added by manufacture, exclusive of outlay for materials, amounted to nearly $93,000,000. They paid nearly $34,000,000 in wages to 25,626 wage earners and provided a market for materials amounting to more than $136,000,000. The five States of New England produced in 1925 more than one-fourth of the value of the national output of paper and wood pulp, with 27 per cent of the national value added by these manufacturers and a similar proportion of workers and wages.

A very considerable reduction in the manufacture of paper and wood pulp is observed from 1925 to 1927. This reduction was most pronounced in Maine, so that in the latter year the output and the revenue of this State was surpassed by those of Massachusetts. In the latter State, as a matter of fact, there was an increase in the value of the product and a substantial growth in revenue, as a consequence of a material reduction in the outlay for materials. In Connecticut also the industry shows a slight increase in revenue, although there was a considerable reduction in value of product.

Some paper mills market their entire output as paper, while others sell the pulp, and still others produce and sell both paper and pulp. Furthermore, some companies convert their own product, while other manufacturers purchase all their raw material from the paper mills and act only as converters. In the present discussion, therefore, it is to be borne in mind that the manufactures in the primary group include not only those which sell pulp and paper but some which act also as converters in the manufacture of secondary paper products. Approximately 70 per cent of the entire wood-pulp production of the United States is consumed in the establishments where the pulp is made, by manufacturing it into products for final consumption.

To the national total in 1925 Maine contributed 11.3 per cent of the value added by all primary paper manufacture and Massachusetts contributed 9.8 per cent. In that year Maine produced 25 per cent of the total United States tonnage of ground, soda, and sulphite pulp, amounting to 875,600 tons. Ground pulp accounted for more than half of this—55 per cent—while sulphite fiber comprised 33 and soda fiber 12 per cent. Maine contributed more than 30 per cent of the value of the domestic production of newsprint and, in addition, large quantities of kraft and book paper, paper bags, and paper board, besides fine paper from chemical wood fiber. Newsprint, with a volume of 469,900 tons and a value of $32,859,000, represented 34 per cent of the total value of paper production in Maine. Substantial quantities of wood pulp and paper are produced also in the neighboring States of New Hampshire and Vermont, but the separate values are not given.

PRIMARY MANUFACTURE OF PAPER AND WOOD PULP IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Number of establishments	Total persons engaged	Wage earners	Thousands of dollars				
				Wages and salaries	Wages	Cost of materials	Value of products	Value added by manufacture
Maine:								
1927	25	(1)	8, 132	(1)	11, 122	53, 145	88, 595	35, 450
1925	38	13, 023	11, 833	19, 722	15, 871	54, 203	95, 571	41, 368
Massachusetts:								
1927	80	(1)	12, 127	(1)	15, 608	50, 383	91, 095	40, 712
1925	84	14, 323	12, 915	20, 732	16, 434	54, 854	90, 127	35, 273
New Hampshire:								
1927	24	(1)	2, 487	(1)	3, 204	17, 670	24, 616	6, 946
1925	25	5, 363	4, 793	7, 302	5, 902	24, 996	37, 061	12, 065
Connecticut:								
1927	32	(1)	1, 898	(1)	2, 753	9, 228	16, 154	6, 926
1925	35	2, 479	2, 208	3, 752	2, 909	11, 385	18, 161	6, 776
Vermont:								
1927	14	(1)	982	(1)	1, 196	5, 767	8, 712	2, 945
1925	17	1, 523	1, 387	2, 143	1, 814	6, 410	9, 745	3, 335
Total:								
1927 [2]	175	(1)	25, 626	(1)	33, 883	136, 194	229, 172	92, 979
1925 [3]	199	36, 721	33, 136	53, 677	42, 920	151, 848	250, 665	98, 817
1914	221		30, 501		18, 768	71, 618	111, 986	40, 368
1904	227		24, 831		12, 416	42, 421	72, 763	30, 342
United States:								
1927	710	109, 141	98, 566	134, 093	130, 475	574, 786	919, 891	347, 106
1925	763	135, 929	123, 842	196, 461	160, 146	605, 860	971, 882	366, 022
New England as per cent of United States in 1925	26. 1	27. 0	26. 8	27. 3	26. 8	25. 1	25. 8	27. 0

[1] Not compiled.
[2] Not including Rhode Island.
[3] Exclusive of 1 establishment in Rhode Island.

In the production of fine rag paper Massachusetts is the leading State, with 58 per cent of the national value of all fine rag paper in 1925. In full rag paper its lead is particularly noticeable, with 89 per cent of the national total; for paper in which rag is the major material Massachusetts produced 75 per cent, and in papers with a minor rag content, 33 per cent of the value for the United States. This State produced also 37 per cent of the national value of all cover paper, and substantial quantities of boards, tissue, and miscellaneous paper products. Massacusetts and New Hampshire together produced more than 15 per cent of the fine chemical wood paper, including sulphite bond, of the entire United States output.

In Connecticut the principal product of paper mills is boards, which in 1925 amounted to a volume of upward of 90,000 tons and a value of $6,679,000.

The trend of primary paper manufacture over a 25-year period, as indicated by the number of wage earners employed in all New England mills, shows that in 1925 there were 2,600 more workers than in 1914 and 8,300 more than in 1904. Total wages paid in 1925 were nearly 130 per cent greater than those paid in 1914. The value of the product and the income derived from manufacturing show corresponding increases. The expansion in New England from 1914 to 1925 was less than that for the country as a whole. However, the increase in New England amounted to 145 per cent, while for the whole United States there was an increase of 207 per cent in this 11-year period.

The national production of paper shows a rapid and continuous increase during the last quarter of a century, and now exceeds 10,000,000 tons a year. At present the principal item, in point of volume, is paper boards, the volume of which has nearly trebled since 1914. The tonnage of newsprint production amounts to considerably less than one-half that of paper boards. This has shown little tendency to increase in recent years. Production of other kinds of paper has grown steadily. Wrapping paper and book paper are now produced in approximately equal volume and the volume of each is not far below that of newsprint. The following table shows the total domestic production of the principal kinds of paper from 1889 to 1927, inclusive.

UNITED STATES PAPER PRODUCTION BY KINDS, 1899–1927

[Thousands of short tons]

Year	Total	Boards	Newsprint	Wrapping	Book	Fine	All other
1927	10, 003	3, 774	1, 520	1, 525	1, 329	[illegible]	1, 346
1926	10, 000	3, 650	1, 686	1, 450	1, 411	500	1, 303
1925	9, 182	3, 281	1, 647	1, 298	1, 368	474	1, 115
1923	8, 029	2, 793	1, 521	1, 151	1, 242	377	946
1922	7, 018	2, 156	1, 448	1, 048	982	361	1, 023
1921	5, 356	1, 665	1, 226	782	726	242	714
1920	7, 335	2, 313	1, 512	1, 044	1, 104	389	972
1919	6, 190	1, 950	1, 374	870	915	344	738
1918	6, 052	1, 927	1, 260	891	849	368	756
1917	5, 920	1, 805	1, 359	844	892	288	731
1914	5, 270	1, 292	1, 321	882	935	248	593
1909	4, 217	883	1, 176	763	695	198	502
1904	3, 107	521	913	644	516	147	3, 107
1899	2, 168	394	569	535	323	113	233

The importation of newsprint has undergone a steady and rapid increase in recent years, as is shown by the succeeding table. The bulk of these imports comes from Canada, and the greater part of Canadian production of newsprint is accounted for by the importations into the United States.

NEWSPRINT PRODUCTION IN UNITED STATES AND CANADA, AND IMPORTS AND EXPORTS, 1918–1928

[Thousands of short tons]

Calendar year	Domestic production	Total imports	Total exports	Imports from Canada	Total Canadian production
1928	1, 415	2, 157	11	1, 926	2, 381
1927	1, 486	1, 987	12	1, 776	2, 087
1926	1, 678	1, 851	19	1, 657	1, 882
1925	1, 530	1, 448	23	1, 295	1, 522
1924	1, 481	1, 357	17	1, 197	1, 353
1923	1, 485	1, 309	16	1, 108	1, 251
1922	1, 448	1, 029	26	896	1, 082
1921	1, 225	793	17	657	808
1920	1, 512	730	46	679	875
1919	1, 375	628	110	624	803
1918	1, 260	596	97	581	735

PULPWOOD AND WOOD PULP

PULPWOOD CONSUMPTION

Depletion of native sources of pulpwood in recent years has encouraged the bringing in of increasing quantities of wood and pulp from Canada. Some of the large paper companies have transferred a considerable portion of their activities to the Canadian forests. Increasing quantities of wood pulp are being imported from Canada and Newfoundland and from the countries of northern Europe. Consumption of pulpwood in New England, in the past five years, has ranged from 1,600,000 to 1,800,000 cords annually, representing between one-third and one-fourth of the total United States consumption. In New England it reached its maximum in 1920. The bulk of the pulpwood consumed by New England mills is spruce, this variety comprising 64 per cent of the total in 1925. Minor amounts are contributed from poplar, balsam fir, and hemlock. The figures of consumption of domestic and imported pulpwood, for each of the producing States of New England in 1925, are shown in the next table.

Imports of pulpwood into the entire United States in the last few years have ranged from 1,280,000 to 1,500,000 cords annually, with a total value of $13,000,000 to $15,000,000.

Production of wood pulp in New England, in the last few years, has varied from 1,125,000 to 1,276,000 tons annually.

Pulpwood Consumption and Wood Pulp Production by States for Specified Years, 1899 to 1926

[All quantities in thousands]

Year	United States		New England[1]		Maine		New Hampshire		Massachusetts		Vermont	
	Pulpwood consumed	Wood pulp produced	Pulpwood consumed	Wood pulp produced	Pulpwood consumed	Wood pulp produced	Pulpwood consumed	Wood pulp produced	Pulpwood consumed	Wood pulp produced	Pulpwood consumed	Wood pulp produced
	Cords	*Tons*	*Cords*	*Tons*	*Cords*	*Tons*	*Cords*	*Tons*	*Cords*	*Tons*	*Cords*	*Tons*
1926	6,766	4,395	1,833	1,276	1,298	946	431	249	55	35	49	46
1925	6,094	3,962	1,713	1,215	1,240	918	370	217	54	33	49	47
1924	5,768	3,723	1,600	1,123	1,234	895	269	152	48	30	49	46
1923	5,873	3,789	1,720	1,191	1,274	901	311	188	47	31	88	71
1922	5,549	3,522	1,648	1,125	1,239	863	302	179	43	28	64	55
1921	4,557	2,876	1,345	927	1,005	710	258	153	35	22	47	42
1920	6,114	3,822	1,966	1,315	1,389	943	404	240	56	35	117	97
1919	5,478	3,518	1,820	1,268	1,280	917	376	232	52	33	112	86
1918	5,251	3,314	1,726	1,218	1,235	873	345	230	46	31	100	84
1917	5,480	3,510	1,892	1,292	1,309	899	417	267	56	31	110	95
1916	5,229	3,435	1,786	1,286	1,199	852	471	341	28	19	88	74
1914	4,471	2,893	1,323	------	941	------	382	------	------	------	------	------
1909	4,002	2,491	1,371	902	904	604	350	213	46	26	71	59
1904	3,051	1,922	1,087	720	674	457	291	174	47	28	75	61
1899	1,986	1,180	637	442	342	232	197	120	39	25	59	65

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[1] Four States.

Imports of Pulpwood into the United States, 1917–1928

Year	Total quantity	Total value	Year	Total quantity	Total value
	Cords			*Cords*	
1928	1,546,338	$16,157,295	1922	1,044,816	$11,002,636
1927	1,596,787	16,484,345	1921	1,081,634	15,387,355
1926	1,383,619	14,176,256	1920	1,241,444	16,902,939
1925	1,483,231	15,129,562	1919	1,047,299	10,458,753
1924	1,279,975	13,107,647	1918	1,370,027	13,362,566
1923	1,347,927	13,405,927	1917	1,031,934	8,563,458

Pulpwood Consumption of Individual States in 1925

[Thousands of cords]

State	Number of establishments	Total quantity	Cost (thousands of dollars) f. o. b. mill	Spruce		Hemlock		Poplar		Balsam fir		All other
				Domestic	Imported	Domestic	Imported	Domestic	Imported	Domestic	Imported	
Maine	29	1,240	22,963	808	111	22	19	120	46	52	32	31
New Hampshire	9	370	7,962	233	117	1	------	------	------	5	------	14
Massachusetts	3	54	1,247	37	12	------	------	5	1	------	------	------
Vermont	6	49	897	35	7	------	------	------	------	6	------	------
Total	47	1,713	33,069	1,113	247	23	19	125	47	63	32	45
United States	234	6,094	94,340	2,253	818	1,103	22	207	196	215	53	334

WOOD PULP PRODUCTION

The volume of wood pulp produced in New England, with the total value and the average value per ton, is presented in the following table. This shows the overshadowing importance of Maine, which produced more than 75 per cent of the New England total, while New Hampshire produced 18 per cent. The total production of the four contributing States in 1925 amounted to 1,214,390 tons, with a value of $61,393,590, representing upward of 30 per cent of the total for the United States.

PRODUCTION AND VALUE OF WOOD PULP BY INDIVIDUAL STATES IN 1925

State	Quantity in tons	Value	
		Total	Average per ton
Maine	917, 632	$42, 035, 170	$45. 81
New Hampshire	217, 489	15, 408, 304	70. 85
Massachusetts	32, 672	2, 322, 163	71. 08
Vermont	46, 597	1, 627, 953	34. 94
New England (4 States)	1, 214, 390	61, 393, 590	50. 55
United States	3, 962, 217	195, 138, 220	49. 25
New England as per cent of United States	30. 7	31. 5	

IMPORTS OF WOOD PULP

Imports of wood pulp into the United States from 1923 to 1928 ranged in value from $1,383,000 to $1,736,000 annually, showing a steady and substantial increase each year. About half of these imports came from Canada and the rest from northern Europe. The rate of increase has been about the same for Canada as the total for the other countries. A considerable proportion of the imports from Canada consists of mechanical pulp, but most of those from other countries are chemical fiber. The importation of wood pulp into the United States since 1919 has run parallel in tonnage with the importation of standard newsprint, both of which show marked increases year by year.

UNITED STATES IMPORTS OF WOOD PULP, 1917–1927

[Thousands of short tons]

Year	All processes			Chemical			Mechanical		
	Total	From Canada	From other countries	Total	From Canada	From other countries	Total	From Canada	From other countries
1927	1, 680	780	900	1, 434	549	885	246	231	15
1926	1, 736	864	867	1, 428	582	846	304	282	21
1925	1, 664	880	784	1, 333	584	748	331	296	35
1924	1, 523	713	810	1, 277	508	769	246	205	41
1923	1, 383	721	636	1, 083	487	590	300	234	66
1922	1, 259	645	613	1, 043	455	587	215	190	21
1921	697	403	294	506	265	241	191	137	53
1920	906	655	251	673	457	216	233	198	35
1919	636	519	117	434	318	116	202	201	1
1918	578	572	7	393	386	7	185	185	
1917	678	413	265	399	227	172	279	260	19

SECONDARY PAPER INDUSTRIES

Aside from the primary manufactures of paper mills, the conversion of raw paper and pulp, outside of paper mills, into finished products, such as boxes, cases, cartons, bags, envelopes, writing and printing paper, and various other paper goods, represented a New England production valued in 1925 at more than $100,000,000, engaged the activities of over 18,000 wage earners and added to the manufacturing income of New England upward of $50,000,000.

PAPER BOXES

In the manufacture of boxes (including shipping containers, both solid and corrugated, set-up and folding paper boxes and cartons) from paper and other fibers, New England contributed in 1925 about 12 per cent of the national production and engaged nearly 15 per cent of the wage earners. This branch of the paper industries shows a substantial increase in the number of wage earners since 1914 and also since 1904. Massachusetts produces about 65 per cent of the value of the New England output and contributes 60 per cent of the regional manufacturing revenue from this source, while Connecticut represents about 28 per cent of the output and 31 per cent of the manufacturing revenue.

In the manufacture of paper boxes the value of the New England output increased substantially from 1925 to 1927, although there was a slight falling off in the number of establishments and in wage earners, accompanied by a slight increase in wages paid and a very material increase in the outlay for materials used in manufacturing, resulting in a slight reduction in the revenue from this activity. In Massachusetts and Rhode Island there were material increases both in value of product and in net revenue, but there was some falling off in Connecticut.

MANUFACTURE OF PAPER AND OTHER FIBER BOXES IN NEW ENGLAND STATES

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	117	5, 300	5, 135	12, 505	24, 264	11, 759
1925	122	5, 248	4, 976	10, 827	21, 556	10, 729
Connecticut:						
1927	42	2, 021	2, 125	4, 592	8, 917	4, 325
1925	43	2, 201	2, 198	3, 578	9, 187	5, 609
Rhode Island:						
1927	11	528	468	571	1, 486	915
1925	11	393	345	397	1, 071	675
Maine:						
1927	12	285	211	337	729	392
1925	13	284	185	252	679	427
New Hampshire:						
1927	9	168	140	408	710	302
1925	8	238	213	310	758	448
Total:						
1927	191	8, 302	8, 679	18, 412	36, 105	17, 693
1925 [1]	197	8, 364	7, 917	15, 364	33, 251	17, 888
1914	174	7, 400	3, 318	6, 070	12, 042	5, 972
1904 [2]	154	5, 919	2, 068	3, 378	7, 225	3, 847
United States:						
1927	1, 219	56, 398	57, 701	168, 464	306, 555	138, 091
1925	1, 229	57, 148	57, 172	151, 712	281, 944	130, 232
New England as per cent of United States:						
1925	16. 0	14. 6	13. 8	10. 7	11. 8	13. 7

[1] Exclusive of 3 establishments in Vermont.
[2] Exclusive of 1 establishment in Vermont.

NOTE.—No separate figures are available for the different types of containers.

MISCELLANEOUS PAPER PRODUCTS AND ENVELOPES

In the manufacture of miscellaneous paper products the New England factories increased their activity and their output substantially from 1925 to 1927. The number of establishments increased in Massachusetts by 5 and in Rhode Island by 1, while in Connecticut there was a reduction of 1.

In the manufacture of envelopes there was considerable increase in Massachusetts, which is the only important producing State in this line. Massachusetts produced nearly a quarter of the national value in 1925.

In miscellaneous paper products, such as paper cores and tubes, drinking cups and dishes, towels and toilet paper, and waxed paper, New England in 1925 produced 17 per cent of the national output. Upward of three-fourths of the New England production comes from Massachusetts, while Rhode Island and Vermont each contributed 11 per cent of the New England total. The manufacture of labels, tags, and cards is also of considerable importance in New England, one of the country's principal manufacturers in this line being located in Massachusetts.

MANUFACTURE OF MISCELLANEOUS PAPER PRODUCTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	54	2, 007	2, 414	11, 015	18, 241	7, 226
1925	49	1, 844	2, 218	9, 374	15, 896	6, 522
Rhode Island:						
1927	11	400	456	1, 175	2, 345	1, 170
1925	10	384	440	1, 033	2, 309	1, 275
Vermont:						
1927	5	201	201	1, 752	2, 340	588
1925	5	216	208	1, 850	2, 372	522
Connecticut:						
1927	4	36	47	120	229	105
1925	5	43	49	136	262	126
Total:						
1927	74	2, 644	3, 118	14, 062	23, 155	9, 093
1925	69	2, 487	2, 915	12, 393	20, 839	8, 445
United States:						
1925	310	13, 386	15, 403	70, 700	124, 217	53, 517

MANUFACTURE OF ENVELOPES IN MASSACHUSETTES

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	17	2, 228	2, 490	7, 869	13, 876	6, 007
1925	16	2, 027	2, 220	6, 687	11, 924	5, 237
1914	11	1, 781	808	2, 850	4, 979	2, 129
United States:						
1927	153	9, 745	10, 755	28, 973	56, 006	27, 033
1925	135	9, 052	9, 987	27, 423	51, 189	23, 766
Massachusetts per cent of United States in 1925	11. 9	22. 4	22. 2	24. 4	23. 3	22. 0

GENERAL VIEW OF THE PAPER INDUSTRY

The experiences of manufacturers of paper products in the various parts of New England, based upon conditions of production and marketing that have existed in this industry in the last few years, are summarized in the following paragraphs. This portrays, in general, the present situation in New England paper manufacture.

In reply to inquiries which were sent to every paper manufacturer in New England, 174 paper companies, with sales aggregating over $200,000,000, provided information regarding their operations and marketing practices. These replies represented well over half (57 per cent) of the total New England output of paper and paper products. The representation by States was as follows: Massachusetts 105, Connecticut 29, Maine 12, New Hampshire 12, Rhode Island 9, Vermont 7. Other concerns which submitted partial information, and which are not included in these totals, bring the number of companies replying up to 185.

GROUPS REPORTING

In order to bring out the full significance of the information supplied by these firms, the replies were classified in four groups, calculated to represent the different types of market reached by their products. The first group includes paper mills which are primary makers of paper from wood pulp and other raw materials. There were 43 companies reporting in this group, with aggregate sales of $98,500,000. The materials most commonly used by them were reported as pulp, or pulp wood, and rags. The pulp mills use also considerable quantities of lime, alum, sulphur, and other chemicals for processing. Sixteen companies reported as their major product fine paper (bond, ledger, and writing); 10 of them make tissue, 3 others newsprint, and 3 manufacture book and other special kinds of paper, in addition to pulp. Six of these concerns reported the sale of wood pulp as well as paper.

The second group comprises companies which purchase paper or pulp from the mills and finish it for the market. This class includes the concerns known in the trade as converters. There were 36 companies in this group with aggregate sales exceeding $46,000,000. The products represented were glazed, embossed, and surface-coated paper, ledger paper, writing paper and envelopes, tablets, gummed and waxed wrapping paper, toilet paper, bags, labels, and cards. Several of these concerns make also paper boxes or other special paper products. The principal purchased materials reported by this group, in addition to paper, are china clay, casein, colors, wax, and glue. The raw paper comes in most instances from New England sources, while the other materials were reported to be purchased mainly in New England or in New York City.

In the third group are the makers of folding or set-up boxes, cartons, and cases. There were 65 replies in this group, reporting sales that exceeded $31,000,000. The principal materials used by these box manufacturers were reported as plain or corrugated paper board or Bristol board, glue, and a few other minor materials, all of which were said to be purchased generally in New England.

The fourth group includes makers of a various line of paper products, of which the principal ones are box board and Bristol board, fiber materials, tubes, cores, cloth rolls, cups and containers for liquids, wall paper, roofing paper, and building paper. Materials most commonly used by these are waste paper and rags, other paper stocks, strawboard and chip board, with special materials for individual products. These raw materials are obtained for the most part within New England. There were 30 companies reporting in this group of products, with total sales exceeding $25,000,000.

AGE OF INDUSTRIES

The primary manufacturers of paper, as a whole, have been established longer than the other groups, about 70 per cent of these 43 concerns having been in business for more than 25 years, in contrast with about 50 per cent in the other lines. The average age of all paper mills reporting was 39 years. This average is considerably higher in Massachusetts than in Maine, New Hampshire, and Vermont. A few of these mills have been in operation for a century, and there were several whose age exceeded 60 years. Three of the concerns have come into business within the last 10 years. Of 33 converters making finished paper, on the other hand, 10 had been established within 10 years, and of 65 box manufacturers, 11 had come into existence within the last decade.

Greater stability is indicated in paper manufacturing than in some of the other industries of New England, as reflected by a comparison of changes in management. The average period under present management for the reporting paper mills was 23 years, and for the miscellaneous group 15 years. One-fourth of the primary manufacturers indicated changes of management within the preceding 10-year period, and one-third of the makers of finished paper, while among the makers of paper boxes the proportion was one-fifth.

SIZE OF ESTABLISHMENTS

There is striking contrast in the scale of individual operations among these four groups. In the primary group the average employment in 1925 was 346 workers and the average sales $2,400,000. The average for the paper converters, with 188 employees and average sales of $1,293,000, was only a little over one-half that of the preceding group. The makers of miscellaneous paper products show a considerably smaller average size, with 99 employees and average sales of $900,000 in 1925; while the box manufacturers showed the smallest average, with 73 employees and average individual sales of $480,000.

As regards the size of individual establishments, the 43 primary manufacturers included 20 concerns, each doing a business exceeding $1,000,000, and these accounted for about 90 per cent of the total sales for this primary group. Of these companies there were six whose individual sales ranged between $5,000,000 and $15,000,000; each of these employed over 500 workers, these 6 thus accounting for two-thirds of the total employment for the group of 43 companies.

Of the 36 converters making finished paper, 4 companies, with individual sales of several million dollars each, accounted for over four-fifths of the aggregate sales of the group, while 26 smaller concerns, with business ranging from $500,000 to less than $100,000, accounted for only 8 per cent. Of these concerns there were 31 which employed fewer than 100 workers each; these accounted for only 13 per cent of the total reported employment in this group.

Among the 30 manufacturers of miscellaneous paper products 5 of the largest concerns accounted for 85 per cent of the aggregate sales, while 23 concerns with sales between $500,000 and $10,000 accounted for only 15 per cent of the sales and 25 per cent of the employment.

Among the 65 box manufacturers there were 9 concerns with individual sales ranging between $500,000 and $10,000,000, which accounted for 74 per cent of the group total, and 44 concerns with sales under $250,000 each, which accounted for only 12 per cent. Only 14 of these companies employed over 100 workers each, and 41 of them employed fewer than 50 workers each.

CONDITIONS OF PRODUCTION

Reports of changes in plant capacity since 1921 indicate that increases were most numerous among the manufacturers of paper boxes, while the most outstanding individual increases were in the group making miscellaneous paper products. Thirty of the box manufacturers added to their capacity in proportions ranging from 10 to 100 per cent; 17 of these made increases from 50 to 85 per cent, while 5 other concerns reported 100 per cent increase. Among the makers of miscellaneous paper products seven companies reported increases. A small company making cups reported 200 per cent increase, and another making paper containers reported 100 per cent increase. A maker of fiber sheets, doing a $3,000,000 business, increased his capacity by 150 per cent, and a large maker of paper roofing material reported an increase of 75 per cent.

Among the primary manufacturers operating paper mills, 2 of the largest reported increases of 12 and 20 per cent, while 2 others reported 35 and 100 per cent, respectively. On the other hand, 1 very large concern and 1 medium-sized mill reported reductions of 10 and 15 per cent each. Among the converters of finished paper, eight concerns reported additions of 10 to 50 per cent. A $5,000,000 concern reported a 50 per cent increase, and a concern still larger increased 10 per cent.

A fair indication of activities in the different groups is afforded by the ratio of the output in 1925 to the maximum capacity of plants in that year. Most of the companies indicated this in terms of percentages, and from their replies a weighted average for the group was obtained, based upon their 1925 sales figures. The box manufacturers showed the highest proportion, with 83 per cent of maximum capacity. The converters of finished paper showed 80 per cent, while the miscellaneous paper manufacturers had an average of 78 per cent. Among the paper mills engaged in primary manufacture, with aggregate sales of $83,500,000, the average output was 78.2 per cent of maximum 1925 capacity.

LABOR AND EMPLOYMENT

The seasonal tendency of employment is less pronounced in the paper industries than in some of the other lines of New England manufacture. Among the paper mills and the converters the replies indicated that in 1925 employment reached its peak during the month of April and gradually diminished until late in the fall. The variation from month to month in the number of wage earners employed in New England paper mills, as shown by the census for that year, was 8.1 per cent of the average number for the year. This is considerably lower than the variation in several other New England industries.

The seasonal tendency has been smoothed out in part by the development of new lines of products, especially among the paper mills of Massachusetts and Maine. The tendency toward shorter commitments on the part of buyers has tended also to bring about more uniform operation of mills throughout the year. One large manufacturer of fine writing paper reported the addition of paper towels and bleached pulp for rayon manufacture to his main line. Another making tissue paper has added crêpe-paper napkins. Other concerns have been able, by careful study of the market, to maintain uniform production without supplementary lines.

Among the makers of paper goods the replies indicated a variation of employment between minimum and maximum periods of about 3 per cent, which is remarkably low in comparison with other industries. This is the result, in part, at least, of definite efforts to develop supplementary lines of products that are manufactured during otherwise slack periods. The manufacture of standard items for stock during dull periods is also generally reported.

Among the paper-box manufacturers also the replies indicated only slight change in the total number of employees at different periods of the year. There is evidence in many of the reports that this condition is the result of definite efforts to provide supplementary products to overcome seasonal tendencies. One manufacturer states that he is constantly seeking new uses for boxes in order to create a demand during slack periods, and a similar policy was reported among many other plants.

INCENTIVE METHODS OF PAYMENT

The use of incentive methods of wage payment, such as piecework or similar means, varies widely among these different groups of paper manufacturers. Many of the paper mills find it difficult to pay otherwise than on an hour or day basis, on account of the irregularity and variety of operations requiring attention, and because of the automatic machine processes that are employed. This makes it difficult to set up standards upon which an equable plan of payment based upon results can be built. The impression prevails also among many mill executives that on account of the mechanical nature of most of the processes of producing paper the question of wage incentives does not merit a great deal of attention. There are, however, some New England paper mills that are paying a considerable proportion of their workers on an incentive basis. One Massachusetts concern making bond paper reported the payment of all its workers on this basis, and another pays 95 per cent of its workers on such a basis; while a large company in Maine making fine writing paper reports 80 per cent of its workers paid by piecework. Several other concerns reported from 10 to 25 per cent of their workers paid in this manner.

Of the concerns making paper products only a few indicated the use of incentive methods of payment, but in individual cases as high as 50 per cent of workers are paid on this basis. The box manufacturers are a conspicuous exception in the paper industry, for in this group 70 per cent of the establishments reported the use of piecework or other incentive methods among their employees. The proportions range from 10 to 100 per cent of their pay roll, the most common proportion being from 50 to 60 per cent.

IMPROVEMENTS IN PRODUCTION

Improvements in one or more important phase of manufacturing activity have been general in the paper industry. These improvements are not limited to the larger concerns, as more than 80 per cent of all those replying indicated that they have been devoting thought and study to the improvement of their manufacturing conditions. Among the primary manufacturers a good deal of attention has been given to the continuous maintenance of equipment, as well as to organization and executive control. A large number of instances indicated attention to improved methods of production control and of cost accounting. Industrial research is receiving special attention among several of the larger companies.

Among the makers of paper products efforts have been made to standardize materials and products and to maintain continuous operation of plant and equipment. One concern reported that by the development of purchasing schedules and the resulting improved rate of turnover, its investment in inventory has been reduced, while another stated that production control methods had been responsible for an increase in average monthly production from 200,000 to 650,000 pounds within a 5-year period. In another case the motorizing of machines and running them through the noon hour was said to have resulted in an 80 per cent increase in production.

One box-manufacturing concern reported the reduction of costs by increasing the output per employee and reducing labor turnover. In this connection another stated that a bonus system of wage payment has been of assistance. In another instance the reorganization of sales efforts and better production methods are credited with an increase of approximately 20 per cent in sales. Methods of cost accounting are credited by another manufacturer as of the greatest benefit.

The attitude of the paper mills of New England in regard to the installation of new and improved equipment is indicated by replies to a special inquiry directed to a number of leading executives of the industry. These executives indicated that it is their general practice to make constant improvements in machinery that will result in increased output and improved quality of product. This often means a very heavy financial outlay. One executive stated, "Once we are convinced of the practicality of any improvement presented to us, we never hesitate to put it into operation immediately, often only experimentally. We feel satisfied that there are a number of concerns in New England which have the same policy; but at the same time we know of some others which are definitely suffering because they have not operated on this policy." Another executive says, "We have met with much success in designing and building machines of our own invention to replace hand operation." The executive of another company reports that during the last six years his company's efforts have been redoubled along the line of improved equipment, to the extent of scrapping thousands of dollars worth of machinery.

SALES AND MARKETING

In considering the trend of sales in the paper industry it is important to bear in mind the pronounced changes in price of paper and paper products during recent years. These, of course, are reflected in the changes in total value of production, as well as in the sales of individual companies. A falling-off in value of total sales, therefore, does not necessarily mean a corresponding reduction in plant activity. The pronounced contrasts in sales trends since 1921 among the different groups of manufacturers are doubtless attributable in some measure to price variations.

Each of the four groups had a pronounced increase in sales from 1921 to 1923, as shown by the records of the reporting companies, but the manufacturers of paper products and of paper boxes surpassed the primary manufacturers and converters to a noticeable extent. From 1923 to 1925 the sales trend of the former group continued to advance, while the total for the primary manufacturers shows a falling off.

Among the primary manufacturers the aggregate sales of 38 concerns, making a total of $97,000,000 in 1925, reveal an increase of 34 per cent from 1921 to 1923, followed by a decrease of 6 per cent from 1923 to 1925. This falling off occurred in 1924 and was partly made up by increased sales in 1925. While all but 4 of these companies showed increases in individual sales from 1921 to 1923, there were 20 whose sales decreased in 1925 from those of 1923. Sixteen concerns showed a continuous increase in volume of individual sales from 1921 to 1925, while 6 others showed decreases in this period. No relation is observed between the sales trend and the size of business, as some of the largest companies show decreases and some of the smaller ones show increases.

The converters making finished paper show less shift in their sales trend in the different years. The aggregate for 30 converters, with sales of $46,000,000 in 1925, showed a smaller rate of increase (22 per cent) from 1921 to 1923 than that of the primary manufacturers; but the converters' increase continued through 1925, with a slight decrease in 1924, resulting in a net increase of 6 per cent over the 1923 figure. All but 6 of these 30 companies had a greater volume of sales in 1925 than in 1921. Eleven firms, including one $5,000,000 company, had a falling off in 1925 sales as compared with 1923; while 14 others, including 3 concerns of over $5,000,000 each, had increased sales in 1925.

Among the makers of secondary paper products the aggregate sales show a continuous increase since 1921. The sales for 28 companies aggregating $25,000,000 in 1925 showed an increase in 1923 of 57 per cent over 1921, and in 1925 an increase of 17 per cent over 1923, the total increases from 1921 being 82 per cent. All but four small concerns showed an increase in 1925 sales compared with 1921. Since 1923 there were 16 concerns whose individual sales decreased, including one doing a million-dollar business. There were 12 others whose sales in 1925 surpassed those of 1923, one of these concerns doing a $3,000,000 business, and another concern over $10,000,000.

The makers of paper boxes experienced a net increase throughout this period, as shown by the experience of 63 companies doing a total business of $31,000,000, but their rate of increase was less than that of the makers of miscellaneous products. The sales of 1923 showed an increase of 43 per cent over 1921, and a slight increase, amounting to 1.4 per cent, in the 1925 total compared with 1923, with a slight falling off in 1924. All but eight of the concerns in this group had greater sales in 1923 than in 1921. Significant decreases in sales from 1923 to 1925 were shown by 28 concerns, including 2 concerns doing a $1,500,000 business, and 1 concern of $10,000,000. There were 22 other companies showing significant increases in sales of 1925 compared with 1923, including 5 companies with a business over $1,000,000 each, 1 of these concerns being a $3,000,000 company, another $4,000,000, and another $10,000,000.

Among the mill owners the major reasons for declining sales were given as a general over-capacity, competition from other sections, and high labor costs; while the mills whose individual total sales have increased attribute their increases to lower manufacturing costs, to better sales methods, and to new products. Among the manufacturers of paper goods, those that reported an increase in total sales during the period since 1921 believe the contributing factors have been the extension of sales territory, the application of new and better selling methods, and a reduction of costs, which has enabled them to quote lower prices.

Among the manufacturers of paper boxes that have had an increase in total sales, the largest number consider that lower production costs have been an important factor, although new sales methods and extension of territories are also emphasized. Other concerns whose sales declined during the same period attribute this downward trend to general overproduction and competition. This industry suffered to a considerable extent in the reduction of its market among shoe manufacturers and some other New England industries.

LOCATION OF MARKETS

The replies indicate that most of the New England paper mills sell the greater part of their output outside New England. The weighted average of sales in New England for 37 of these primary manufacturers, with a total output in 1925 of about $94,000,000 was 28 per cent. Two small companies reported the sale of their entire product in New England, and 10 others make the majority of their sales in those States. The reports of 25 mills, including all the largest ones, indicated the great majority of their sales outside New England, their sales in that section in most instances ranging from 10 to 30 per cent, and in some instances less.

The larger paper manufacturers sell their products throughout the United States, but the principal marketing centers outside New England are supplied through New York channels. Exports in this group were reported by 15 concerns, the commonest range being from 1 to 3 per cent, although several companies export a considerable portion. One company, with sales amounting to $1,500,000, reported exports of 13 per cent of the total; another, with sales of $8,000,000, reported 7 per cent; and one concern with sales over $10,000,000 exports 5 per cent of its output.

Among the converters and makers of finished paper, replies from 32 concerns indicated New England sales averaging 19 per cent of their aggregate output; 15 of these, however, reported the majority of their sales in New England, while 17 sell more in other sections of the country. Some of these products have national distribution, but most of them find their principal market in the Middle Atlantic States. Some sales are reported in the Middle West, in the South, and on the Pacific coast. Twelve of these concerns reported exports, the usual range being from 1 to 5 per cent. A maker of special safety paper reported exports of 14 per cent, and a large manufacturer of tags and crêpe paper exports 9 per cent of his output, while a maker of waxed paper reported exports of 8 per cent.

The makers of other paper goods show a much higher proportion of their sales within the New England States. The average for 28 makers of these secondary paper products, with sales aggregating $25,000,000, was 46 per cent of their output in New England. Seventeen of these companies reported the majority of their sales in that section, while 11 reported more than one-half of their output as sold outside New England. Exports were reported by 5 concerns, but only 1 of these reported more than 1 to 3 per cent. This one concern, making fiber sheets and tubes, exported 10 per cent of its product.

Of 65 box manufacturers, with sales in 1925 exceeding $30,000,000, the sales made within New England amounted to 74 per cent of their total output. Thirty-seven of these companies find their entire market in New England, and 25 others sell from one-half to nearly all of their products in those States. Only 6 concerns reported their major sales outside New England, but 2 of these were relatively large establishments. The exports reported by this group are of slight consequence, except in the case of one $10,000,000 box-manufacturing business, which reports exports of 3 per cent of total output.

The replies from the paper mills give evidence that the New England market has become of increasing importance to the primary paper manufacturers, as 80 per cent of them state that sales in New England have been on the increase. These increases are attributed by individual manufacturers to stronger selling efforts, to the increased demand for paper products, such as paper napkins and towels, to direct selling to converters, and to increased purchases by the converting trade. Several concerns indicate increased emphasis upon sales in New England, such as advertising and more extensive canvassing, and circular-letter campaigns. Among the paper-box manufacturers 31 companies reported that sales in the New England market in the preceding three years had been increasing, while 18 reported decreases, and the others indicated little change in the volume of New England business.

CHANNELS OF DISTRIBUTION

The main channels of distribution from the paper mills are to wholesalers and jobbers, or direct to the converters who are engaged in making paper products. A number of mills reported sales through exclusive distributors, while a few sell a portion of their output direct to retailers or through their own stores. About the same number reported sales through single channels of distribution as through multiple channels. Manufacturers of finished paper indicated sales equally to wholesalers and direct to the consumers of their product; this applies also to the makers of secondary paper products.

Among the box manufacturers the principal single channel of distribution is direct to the consumer. This refers to sales to manufacturers who purchase boxes and cases for packing their products. A number indicated sales to wholesalers and jobbers, and several sell direct to retailers. Sixteen of these box manufacturers indicated the use of more than one channel of distribution, while 51 others rely upon a single channel.

The practice in regard to the identification of product by a brand or trade-mark was indicated by 95 replies covering these four groups of manufacturers. Of this number 69 indicated that all or a greater proportion of their product was thus identified, while 26 companies indicated such practice on a minor proportion or on none of the product. Among the different groups the practice of those answering this question was indicated as follows: Of 34 primary paper manufacturers, 27 trade-mark all or the major portion of their product; of 30 converters of finished paper, 17 trade-mark the major portion; of 18 makers of miscellaneous paper products, 15 use a trade-mark; and of 13 box manufacturers replying, 10 indicated the use of trade-marks.

The use of a variety of advertising mediums was indicated. Direct mail is the medium most commonly used, supplemented in numerous cases by the trade journal and by dealer helps. Among the box manufacturers the commonest medium is the trade journal. Four of these concerns reported the use of directories, and 2 others mentioned newspaper advertising. The box manufacturers depend, for the most part, upon local advertising mediums, while those in the other groups, particularly the primary manufacturers of paper and the converters, use national mediums.

SALES ORGANIZATION OF PAPER MILLS

Executives of a number of representative paper mills who were asked to describe their selling organization submitted the plans employed by their companies. These replies are instructive in showing the merchandising methods that are proving successful among some of the prominent mills in New England. The executive of one such concern which maintains a high standard in its product reports that the policy of his company is to restrict its territory to as narrow a radius as possible, in order to economize in delivery costs on a product which runs into considerable tonnage. The large use of its product in this territory enables the company to keep in close touch with its customers' requirements. This company finds it necessary to employ but one salesman, on account of its trade connections with a preferred list of customers, and the bulk of the mill's product is sold by one of the officers.

Another paper mill sells practically its entire output to two customers whom it has supplied for a number of years, thus making it unnecessary to maintain a sales organization. The marketing problems of another concern making a specialty product of high value but low volume is simplified by the fact that its output is marketed under an annual contract. Another mill markets the most of its product through direct-mail advertising, with the aid of circular letters, which are sent frequently to the general trade. In another instance the selling end of the business is divided up among three executives.

In contrast with these instances, one large paper mill reports the establishment, since 1920, of offices in San Francisco and Chicago, with three times the former number of salesmen. Very complete records are kept to show the sales in different localities, the number of times they are visited, and other market information regarding these areas. A great deal of the work of salesmen, who are paid on a salary basis, consists of talking to the trade and introducing the paper. Another manufacturer of high-grade paper held that more aggressive representation and closer contact with the general trade was necessary to market this product under the changing conditions of the industry.

METHODS OF DISTRIBUTION

The methods of distribution vary with the type of product and the policy of the different mills. One of these markets its standardized brand only through merchants, but sales of special paper and of paper to be converted into finished commodities for resale are made direct to the converters. In carrying out this policy the United States is divided into zones, with selling prices for the standardized product made applicable to each respective zone. With this method of distribution the home staff of salesmen is strengthened by the efforts of the company's distributors, giving it a selling force running into the thousands. The salesmen are paid a fixed salary and expenses, with additional compensation based upon the business returns of the company. Another mill follows the policy of selling its product direct from mill to consumers and jobbers, except in the case of newsprint, which is sold direct to the publishers. A part of this concern's product is sold on a commission basis, and the rest is handled directly from its main office and its sales office maintained in New York.

A large manufacturer producing paper of several different types describes his sales organization as follows:

> On all papers which are sold to printers, and consequently bought by them in small quantities for a particular demand, we distribute all over the country through jobbing agencies, which stock our papers and deliver them to the printers. On certain special papers like blue-print papers we sell them through

the artist houses or direct to the trade, where the demand is large. Papers for papeterie purposes we sell to the papeterie converters. Paper for greeting-card purposes we sell sometimes to the greeting-card houses and sometimes to paper merchants who deal with these houses. We also have a number of direct connections with concerns which do converting in a large way.

Another large mill with national distribution divides the United States into five major selling districts, most of which are served by branch warehouses located in different parts of the country. It employs not far from a hundred salesmen, most of whom are paid on a commission basis. This concern has been engaged in an intensive study of the market for its product, with the intention of placing its selling methods on a more scientific basis. In carrying out this program it decided "to separate the functions of merchandising from those of selling, and to establish a merchandising department to have charge of creation of all new articles for sale, in addition to inventory turnover and various other matters that are a function of merchandising, as distinct from selling or marketing."

CHANGES IN THE PAPER MARKET

The attitude of a number of mills and mill executives was obtained also in regard to consumer demand which has made decided changes in the market for the product of New England paper mills during the last few years. One executive reported a tendency on the buyer's part to discriminate more closely regarding quality, along with some tendency to reduce the volume of individual orders, which is encouraged by the rapidly growing method of delivery by automobile truck. Another executive reported that, as a result of small-order buying, the mill is required to carry a large supply of finished paper to meet numerous small orders, calling for many express shipments. Another reply stated that the paper merchants no longer carry such large stocks as they did before the war, and that they are compelling the mill men to do this.

This tendency, in the opinion of another executive, is strengthened by the introduction of standardized mill-advertised brands of paper, thereby creating a certain consumer demand which the merchant is endeavoring to satisfy. He thus calls upon the mill for such quantities as are specified in the ultimate consumer's order. Because of the great variety of these mill-advertised brands, the merchant has come to depend more and more upon the mill which stocks paper rather than upon his own warehouse stock. This in a measure has greatly reduced the unit of sale on the part of the mill as well as of the merchant. Consequently the merchant buys and stocks smaller quantities and the mill carries a greater stock of his particular brand.

Regarding other changes in consumer demand, a converter making writing paper refers to the increase in demand for tissue-lined envelopes and to a change in demand from a medium-sized sheet and envelope to a large-sized sheet and envelope, which has necessitated many changes in plant equipment. This manufacturer reports that there have been many marked changes in consumer demand during the last few years, and refers particularly to the increasing importation of foreign-made writing paper, especially by the department stores throughout the United States.

This competition is held to be a real factor in the industry, not only influencing the prices of merchandise but also leading to changes in styles. It is held that these foreign articles have a psychological effect on the American consumer, and that, since this merchandise can be imported and sold at retail in the United States for less than the cost of domestic production of a similar article, the New England manufacturer feels this competition keenly. Another manufacturer indicates the difficulty of maintaining paper standards in the face of importation of paper at lower figures than cost prices here, by stating, " This makes a very foolish competition, which, I believe, is caused by the fact that some mills do not fairly know their costs; but this fault is not confined to New England."

Regarding changes in quality requirements, the executive of a Massachusetts mill makes the following comment: "As manufacturers of high-grade bond, linen, ledger, and wedding paper, we have noted a marked change in consumer demand. The tendency is to lower grade and lower priced products, which, in these days of modern machine methods in connection with office work in general, answer the purpose very well indeed. In other words, where formerly only rag-content papers would be considered in connection with bond, linen, or ledger papers, the larger buying public to-day requires something that can be bought for much less money, and the result, as you know, is that the larger proportion of all papers is now in the sulphite grades."

PRINTING AND PUBLISHING

The value of output of the printing and publishing industries of New England in 1927 approached $188,000,000 and engaged the activities of some 36,000 wage earners and other persons. The industry contributed to the revenue of the six States more than $136,000,000, and paid some $38,000,000 in wages. It is noticeable that in this industry salaries assume an importance quite comparable with that of wages, on account of the large proportion of workers who are on a salary basis. Salaries in 1925 amounted to $26,678,000. and wages to $36,644,000. The printing and publishing industry provides also a very substantial market for materials, the aggregate outlay for these in 1927 approaching $50,000,000.

MAIN BRANCHES OF INDUSTRY

There were 1,618 New England establishments in 1927 engaged in printing and publishing, in addition to publishers of music. These are classified by the census, on the basis of product, in three groups. The most important group, as shown by number of persons engaged and by value of output, is newspapers and periodicals. In this line there were 594 establishments in the six States. Their output, valued at more than $110,000,000, represented about 58 per cent of the printing and publishing industry in New England.

The other important class includes book and job printing, which represents 40 per cent of the total industry. In this branch there were more than 1,000 establishments in 1927, whose production was valued at upward of $75,000,000. General job printing represented approximately 27 per cent, and books and pamphlets 13 per cent of the total printing industry. A third small group, confined to the State of Massachusetts, is the printing and publishing of music. In this there were in 1927 nine establishments employing 149 wage earners, with an output valued at $1,809,000.

The importance of the two main branches of the printing and publishing industry in each of the New England States is shown for 1925 and 1927 in the following table. The census figures show that each branch has well maintained its position since 1925 and has substantially increased its contribution to the revenue of New England.

PRINTING AND PUBLISHING IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Persons engaged		Thousands of dollars				
		Total	Wage earners	Salaries	Wages	Cost of materials	Value of products	Value added by manufacture
NEWSPAPERS AND PERIODICALS								
Massachusetts:								
1927	332		5, 664		11, 977	22, 077	72, 314	50, 237
1925	333	11, 432	5, 339	12, 023	10, 903	20, 647	66, 617	45, 970
Connecticut:								
1927	89		1, 951		3, 520	5, 320	20, 695	15, 375
1925	87	3, 600	1, 994	3, 686	3, 367	6, 003	19, 916	13, 914
Rhode Island:								
1927	27		709		1, 342	1, 551	6, 682	5, 131
1925	26	1, 188	607	1, 088	1. 240	1, 527	6, 096	4, 569
Maine:								
1927	53		973		1, 205	1, 854	6, 596	4, 742
1925	48	1, 513	928	1, 021	1, 202	2, 089	6, 551	4, 463
New Hampshire:								
1927	58		377		578	478	2, 538	2, 060
1925	49	583	367	330	577	397	2. 016	1, 619
Vermont:								
1927	35		243		361	254	1, 461	1, 207
1925	37	440	252	297	371	251	1, 482	1, 231
Total:								
1927	594		9, 917		18, 984	31, 535	110, 287	78, 752
1925	580	18, 756	9, 487	18, 446	17, 660	30, 915	102, 680	71, 765
BOOK AND JOB PRINTING								
Massachusetts:								
1927	681		8, 569		13, 294	13, 090	57, 852	44, 762
1925	609	11, 907	8, 765	6, 069	13, 542	13, 732	57, 045	43, 313
Connecticut:								
1927	162		1, 721		2, 438	2, 512	8, 260	5, 748
1925	162	2, 271	1, 714	876	2, 439	2, 636	7. 997	5, 361
Rhode Island:								
1927	64		782		1, 068	1, 201	3, 971	2, 770
1925	65	1, 169	867	583	1, 126	1, 297	3, 759	2, 463
New Hampshire:								
1927	37		829		1, 219	469	2, 554	2, 085
1925	32	751	645	164	901	402	1, 978	1, 576
Maine:								
1927	56		360		475	502	1, 677	1, 174
1925	55	521	368	187	468	534	1, 646	1, 112
Vermont:								
1927	24		289		436	367	1, 141	774
1925	25	378	316	96	417	323	1, 103	780
Total:								
1927	1, 024		12, 550		18, 930	18, 142	75, 454	57, 312
1925	948	16, 997	12, 675	7, 975	18, 894	18, 923	73, 529	54, 606

NEWSPAPERS AND PERIODICALS

The number and circulation of newspapers in each State, classified as dailies. Sunday newspapers, weekly newspapers and periodicals, and foreign-language newspapers, are shown as of 1925 in the next table.

Number and Circulation of Newspapers Published in New England in 1925

State	Daily		Sunday		Weekly (including periodicals)		Foreign language				Total	
							Daily		Weekly			
	Number	Circulation	Number	Circulation	Number	Circulation	Number	Circulation	Number	Circulation	Number	Circulation
New England	155	3, 407, 050	27	1, 881, 080	386	1, 689, 153	------	------	----	-------	631	7, 222, 963
Maine	11	388, 967	4	110, 364	[1] 41	[1] 84, 124	------	------	----	-------	56	583. 455
New Hampshire	11	117, 466	----	---------	40	65. 895	------	------	----	-------	51	183, 361
Vermont	10	---------	----	---------	36	68, 567	------	------	----	-------	46	68, 567
Massachusetts	79	2, 435, 763	15	1, 583, 667	214	1, 292, 593	12	90, 673	21	106, 050	341	5, 508, 746
Rhode Island	11	---------	----	---------	12	46, 937	------	------	4	16, 886	27	63, 823
Connecticut	33	464, 854	8	187, 151	47	147, 008	------	------	4	16, 000	92	815, 013

[1] Includes four triweekly or semiweekly publications in Maine with aggregate circulation of 15,971.

INCOME TO STATES

The significance of these publications, as well as that of other periodicals, in terms of money income to the individual States is shown in the table below.

Income of Newspapers and Periodicals in New England States from Subscriptions, Sales, and Advertisements in 1925

[Thousands of dollars]

State	Newspapers		Periodicals	
	Subscriptions and sales	Advertisements	Subscriptions and sales	Advertisements
New England	19, 788	51, 755	9, 824	11, 834
Maine	911	2, 279	1, 255	1, 579
New Hampshire	335	1, 067	61	81
Vermont	321	858	23	39
Massachusetts	14, 375	34, 730	6, 655	5, 475
Rhode Island	1, 176	4, 535	27	143
Connecticut	2, 669	8, 286	1, 802	4, 517

Receipts from total sales and subscriptions of all newspapers and periodicals, with receipts from advertisements, in 1925 amounted to more than $93,000,000. Over two-thirds of this amount came from advertisements and less than one-third from subscriptions and sales. With the newspapers, whose total income was $71,544,000, advertisements accounted for 72 per cent and subscriptions and sales only 28 per cent of the income. Advertising was thus the principal source of revenue. With periodicals, on the other hand, whose total income was $21,657,000, advertisements accounted for less than one-half—45 per cent—and receipts from subscriptions and sales comprised 55 per cent of the total income.

The number and circulation of weekly, monthly, and quarterly periodicals in the different States are shown by period of issue in the next table. It is noticeable that the monthly periodicals greatly overshadow the weeklies and the quarterlies, both in number and in circulation.

NUMBER AND CIRCULATION OF WEEKLY, MONTHLY, AND QUARTERLY PERIODICALS IN NEW ENGLAND IN 1925

Class and State	Number	Aggregate circulation per issue
Weekly:		
Massachusetts	52	880, 930
Connecticut	6	49, 548
Monthly:		
Maine	6	3, 658, 250
Massachusetts	85	2, 934. 306
Connecticut	10	1, 052, 726
New Hampshire	4	12, 226
Quarterly:		
Massachusetts	18	670, 847
Connecticut	3	50, 185

NATURE OF PUBLICATIONS

The character of the publications is shown in the next table. Religious journals lead in circulation, and this type is followed by miscellaneous periodicals and by publications on agriculture, stock raising, and similar subjects. Although the number of trade journals published in Massachusetts is the same as that of religious publications, the circulation of trade journals is naturally much smaller. There is a noticeable number of college and school periodicals, and of publications dealing with commerce, finance, and insurance.

CHARACTER, NUMBER, AND CIRCULATION OF PERIODICALS IN NEW ENGLAND STATES IN 1925

State and character of publication	Number	Circulation
Massachusetts:		
Religion	33	1, 304, 262
Agriculture, stockraising, etc	8	817, 880
News summaries, general literature, and family reading	6	501. 321
Trade journals	33	187, 253
College and school periodicals	23	137, 400
Commerce, finance, and insurance	13	60, 602
Music, art, and drama	7	25, 646
Miscellaneous	31	501, 446
Connecticut:		
College and school periodicals	5	20, 848
Miscellaneous	9	941, 570
New Hampshire: College and school periodicals	3	8, 226

BOOK AND GENERAL JOB PRINTING

The printing and publishing of books, and the commercial printing of pamphlets, circulars, and general advertising matter that goes under the name of job printing, are quite distinct from the printing of newspapers and periodicals, although there is considerable overlapping of establishments whose activities embrace both fields. Book and job printing together are relatively the more important line in New England, comprising 9.1 per cent of the total output of the United States, while in newspapers and periodicals New England's portion was only 7 per cent of the United States total. Book and job printing comprise 40 per cent of the total New England output in the printing and publishing industry. The following table shows for the individual States the value of the output of these branches, as of 1925.

VALUE OF BOOKS, MUSIC, AND COMMERCIAL PRINTING IN NEW ENGLAND IN 1925

[Thousands of dollars]

State	Books and pamphlets, printed and published, or published only	Music, sheet and books	Commercial printing			All other products
			Newspapers and periodicals printed for publication by others	Books and pamphlets printed for publication by others	General job printing	
New England	23. 746	1, 545	5, 690	5, 482	48, 003	65
Maine	76	------------	29	124	1, 940	2
New Hampshire	18	------------	1, 104	262	1, 064	1
Vermont	9	------------	42	164	1. 130	------------
Massachusetts	23, 210	1, 532	4, 298	4, 279	30. 601	20
Rhode Island	4	2	10	32	3, 919	6
Connecticut	429	11	207	621	9, 348	36

Massachusetts stands out prominently in book publishing. This State produced a greater number of textbooks for school use in 1925 than any other State, exceeding considerably New York, its nearest rival, and Illinois. In the number of copies issued on religion and philosophy, Massachusetts ranks fifth in national importance. In each of the five principal classes of books the number of copies is shown for the individual New England States in the following table, as far as figures are available.

NUMBER OF BOOKS PUBLISHED IN NEW ENGLAND STATES, BY CLASSES, IN 1925

Class	Number of copies			
	Massachusetts	Connecticut	New Hampshire	Rhode Island
Textbooks for school use	22, 489, 026	2, 008	20, 000	(1)
Juvenile	2, 448, 758	2, 228	(1)	(1)
Religion and philosophy	976, 923	5, 176	(1)	8, 000
Fiction	654, 479	(1)	(1)	(1)
Poetry and drama	467, 848	16, 730	(1)	(1)

(1) Not available.

The output of general job printing in New England had a value in 1925 slightly exceeding $48,000,000 in the aggregate of $73,529,000 for book and job printing together. Massachusetts leads New England in job printing, with 64 per cent of the New England total and an output of upward of $30,000,000. Connecticut follows, with over 19 per cent and an output of $9,348,000; Rhode Island, with 8 per cent and an output of $3,919,000; Maine, with 4 per cent and an output of $1,940,000. Vermont and New Hampshire each had about 2 per cent and an output slightly exceeding $1,000,000.

In addition to these lines of printing New England produced 10.9 per cent of the national output of sheet and book music. All but a very slight portion of this was produced by nine establishments in Massachusetts, whose output was valued at $1,532,000.

GENERAL VIEW OF THE INDUSTRY

A substantial proportion of the New England concerns in the various classes of printing supplied information regarding their activities. The analysis of these replies is confined for the most part, however, to establishments engaged in commercial printing and in book publishing.

Production of newspapers and periodicals, although of great commercial importance, does not involve special questions of manufacture and marketing to as great an extent as does production of the other types of printed matter, since newspapers and periodicals are a service product for current consumption, which for the most part is sold and consumed locally through channels of direct distribution. They both form a part of the local community structure, rather than of the broader industrial life.

In the production of newspapers and periodicals, activity in New England naturally runs quite parallel with the groupings of population, except in cases of a few centralized publishing houses in special centers, such as Augusta, in Maine, and Springfield and Boston, in Massachusetts.

The printing and the publishing of books and magazines are of outstanding importance in certain centers of New England, notably Concord in New Hampshire, Greenwich and New Haven in Connecticut, and Norwood and Boston in Massachusetts. Two of the largest publishers of school and college textbooks in the whole country have their headquarters in Boston. A large publisher of blank books is located in Holyoke, Mass. In Hartford, Providence, and Worcester there are also important publishing houses.

The printing of circulars, pamphlets, catalogues, labels, color work, and other advertising matter is an important factor in New England industrial life, because it is closely related to the sales activities of many manufacturers. While Boston is naturally the largest center for this work, job-printing establishments are to be found in every city, and there are numerous ones of substantial size throughout New England.

AGE AND SIZE OF ESTABLISHMENTS

The printing of newspapers and periodicals is among the older enterprises of this section, with an average period of operation among reporting establishments of 63 years and a period under present management averaging 29 years. This is considerably greater than for book and job printing, whose average period of operation for 80 reporting establishments was 32 years, with an average of 18 years under present management. Very few establishments in either group had started operations within the preceding six years, and these were engaged in job printing alone. This is likewise the group in which changes of management have been most numerous. Branch establishments are of little consequence in the printing and publishing industry. Only two book publishers reported branches, one of which was in a neighboring New England city and another in the Middle West.

Of 112 companies engaged in commercial and job printing, with a total business in 1925 of $14,235,000, there were 76 whose individual annual output was under $100,000 each, and these account for 23 per cent of the group total. This includes 32 establishments with individual business under $25,000. There were 30 establishments with annual business between $100,000 and $500,000, which accounted for 46 per cent of the group total. Six establishments between $500,000 and $1,000,000 accounted for 31 per cent.

The job-printing establishments are, in general, relatively small. Only 14 of the 112 reporting companies employed 50 or more workers; 8 employed between 100 and 200, and only 1 employed over 200 workers. There were 98 concerns employing fewer than 50 persons, and 52 of these employed fewer than 25 workers.

In pronounced contrast with these is the size of the book-printing establishments. Twenty-seven companies reported in this group with total 1925 sales of $30,987,000. Of this number there were 8 concerns with an individual output exceeding $1,000,000 and representing 90 per cent of the group total. Two of these concerns had an annual business of more than $5,000,000 each. There were 12 concerns between $100,000 and $600,000 and 7 companies of less than $100,000 each. Twelve companies in this group employed upward of 100 persons each, and 3 of these employed more than 500 persons each. There were 11 companies employing fewer than 50 persons, and 4 others employing between 100 and 200 persons.

The representation by States in the job-printing group included 76 in Massachusetts, 19 in Connecticut, 3 in Maine, 7 in Rhode Island, and 7 in Vermont. Of the book publishers there were 19 in Massachusetts, 3 in Maine, 2 in Vermont, and 1 each in Connecticut, Rhode Island, and New Hampshire.

Thirty concerns engaged in job printing reported additions to plant capacity since 1921, with increases ranging from 10 to 50 per cent. Two small concerns reported increases of 100 per cent, and 1 company with an output of $450,000 reported 90 per cent increase in plant capacity. Several others reported individual increases of 50 per cent. The average ratio of output in 1925, as given by 88 companies with a total output exceeding $10,000,000, was 67 per cent of maximum capacity. Five of these concerns reported operations at full capacity and 42 others at 75 to 95 per cent of their maximum, while 39 were operating between 50 and 75 per cent.

Among the book publishers, 5 concerns reported additions to the capacity of their plants. A large publisher of books and magazines in Maine reported a 30 per cent addition and a small book printer in Massachusetts reported 60 per cent addition. A publisher of trade directories in Rhode Island reported 25 per cent increase and a Massachusetts publisher of school books and fiction reported a 15 per cent addition. A large textbook publisher in Massachusetts reported a slight increase in capacity. The output of 19 book publishers aggregating $24,000,000 was 80 per cent of reported maximum capacity in 1925. Four of these were operating at full capacity, 12 at 75 to 95 per cent, and 3 at 50 to 75 per cent.

MATERIALS PURCHASED

The principal raw materials purchased in the printing and publishing industry are paper and printing ink and type metal. Book paper and newsprint were reported as purchased in the New England markets by a majority of the establishments. The sources for ink and for type metal were about equally divided between New England and other sections of the country, principally the Middle Atlantic States.

EMPLOYMENT CONDITIONS

The printing industry is fortunate in the lack of any pronounced seasonal tendency in employment. It remains quite uniform throughout the year. This has been helped to some extent in the group of book and job printers by the development of supplementary products during slack periods. The provision of piecework or other wage incentive does not prevail to any great extent in this industry, only a few concerns in each group indicating that they paid any portion of their workers on a piecework basis. One small job-printing concern, however, reported 60 per cent of its workers on this basis, and another reported 10 per cent. Two other concerns of fair size indicated that 20 per cent of their workers were on a piecework basis, and a very large job printer reported 5 per cent of the workers paid by incentive methods.

Among the book printers a large maker of blank books reported one-half of his workmen on a piecework basis, and another reported 45 per cent. Three other publishers of books and magazines reported a small proportion of their workmen on a piecework basis.

TREND OF SALES

The output of 92 concerns engaged in commercial and job printing showed, in the aggregate, a continuous increase from 1921 to 1925, except for a slight fall in 1922. The 1925 total was 17 per cent greater than that of 1921. The increase in 1923 was 9 per cent above the 1921 output. The aggregate output of 103 companies in 1925 showed an increase of 7 per cent above 1923. For this 2-year period the records of 37 concerns exceeding $100,000 each showed that 13 of them had a falling off in 1925, while 24 increased over 1923.

In book printing the aggregate output of 26 concerns which in 1925 was $30,800,000 showed a continuous growth from 1921, resulting in an increase of 55 per cent. The increase from 1921 to 1923 was 35 per cent, and that from 1923 to 1925 was 15 per cent. Of 19 concerns having individual business exceeding $100,000, 11 showed increases and 6 showed decreases in 1925, while 2 showed no change. Of 8 book-printing establishments exceeding $1,000,000 each, there were 5 which increased, 1 whose output decreased in 1925, and 2 remained unchanged.

LOCATION OF MARKETS

Practically all the reporting concerns engaged in job and commercial printing sell their entire output within New England, but a few companies reported a portion of their market in New York City. A Massachusetts printer of advertising labels reported 55 per cent of his sales in New England and the rest outside. Two other Massachusetts printers of advertising matter marketed 40 per cent of their output outside New England, and a printer of commercial stationery and letterheads reported only 35 per cent of his sales within New England. A Rhode Island printer of tags and labels and a Massachusetts printer of coin wrappers each reported only 25 per cent of their sales within New England. No export business of any consequence was reported by the commercial printers.

While most of the book sales of the smaller companies were reported as made within New England, the larger concerns have national distribution of their products, and sell the greater part of their output outside of New England. Most of these indicated the Middle Atlantic States as their principal market, presumably referring to New York City as a distribution center.

Two large publishers of textbooks stated that exports comprised 6 per cent of their sales. A large publisher of general literature reported an export market amounting to 2 per cent, and another large concern printing blank books reported 5 per cent exported. None of the other book publishers indicated any exports.

MARKETING METHODS

The product of the printing industry is distributed, in most cases, directly by the printer to the user of the printed matter. This channel of distribution was indicated as the prevailing one by the book printers as well as by the job printers, although in a few cases dependence was placed upon wholesale distributors or direct mail. Advertising by the book and job printers is usually by direct mail, while the newspaper and periodical group usually place their advertising in their own or similar publications. The average advertising cost, as reported by 20 establishments in the newspaper and periodical group, was 1 per cent of the total value of output in 1925, and in the book and job group it was 1.3 per cent. Selling cost, exclusive of advertising, for 20 establishments in the newspaper and periodical group was 6.7 per cent of the total value of products, while in the book and job group it was considerably higher, being 12.6 per cent.

In the distribution of books to the consuming public, the retail book store was reported to be the prevailing intermediary between the publisher and the consumer.

IMPROVEMENTS IN MANUFACTURING PROCESSES

A large proportion of the book and job printers reported definite progress in the improvement of various manufacturing practices. The most frequent ones reported were those resulting from cost accounting, from improved relations between management and employees, from organization and executive control, and from the control of production through continuous maintenance of plant and equipment. One reply stated that better cost accounting has been the means of eliminating unprofitable accounts. Another indicates that the keeping of more accurate records of production time in the factory has assured more reliable cost figures. In another case production control is credited with the elimination of nonproductive time in the pressroom.

In another instance direct buying of paper from the mills instead of through paper jobbers is credited with a lessening of costs. In this case it was said that approximately 55 per cent of the total cost of the finished product was represented by the cost of paper. Recognition of the value of research is indicated by another printer in his statement: "Research for analysis of work has developed better production control, and through accurate fixing of costs this has increased sales and profits."

In the group of book and job printers an upward trend in New England sales was reported by 71 establishments, while 28 reported declining sales and the rest had experienced no change. Many opinions were offered to explain both the favorable trend and the unfavorable trend of individual establishments. Several whose sales have declined attributed this falling off to general business depression, while other concerns which have had an increase in business credit the increase to more intensive sales effort or to new sales methods. A change in the demand for job printing was frequently stated as the chief factor in the decline of business of individual establishments.

INDUSTRIES ACCESSORY TO PRINTING

There are several lines of manufacture accessory to the printing and publishing industries which together make up a considerable contribution to the revenue of New England, although they do not stand out especially in the national picture. In these lines most of the activity is concentrated in Massachusetts, although there is some manufacturing in other States.

Bookbinding.—Bookbinding is the most prominent of these accessory lines. In 1927 there were 97 establishments in this line in Massachusetts, Connecticut, and Maine. Eighty-one of these were in Massachusetts, where they gave employment to 2,500 workers and added about $6,600,000 to the State revenue.

Engraving.—Photo-engraving, outside of that done in printing establishments, was represented by 64 concerns engaged in making plates for illustrations, art work, and half-tone engravings. There were 42 of these establishments in Massachusetts, which added upward of $3,000,000 to the State revenue. There were also 14 establishments in Connecticut, which added upward of $850,000 to the State income, besides 5 small establishments in Maine and 3 establishments in Rhode Island in 1925.

Engraving of steel and copper plates and the printing of engraved stationery, cards, stock certificates, maps, and illustrations were represented by 31 establishments in Massachusetts, Rhode Island, and Connecticut, which in 1927 added upward of $3,300,000 to the revenue of these three States.

Lithographing.—Lithographing and printing of calendars, bank notes, commercial and bank forms, maps, and various advertising matter assume considerable importance in Massachusetts, where there were 10 establishments in 1927, which added about $3,300,000 to the revenue of the State. There are individual establishments also in Connecticut and Rhode Island for which no data are given.

IMPORTANCE OF ACCESSORY LINES

The importance of these accessory lines in New England is indicated in the following table. The figurese show no pronounced change in the group since 1925, although increases and decreases appear in the individual items and States.

INDUSTRIES ACCESSORY TO PRINTING IN NEW ENGLAND, 1925 AND 1927

State and year	Establishments	Wage earners	Wages	Cost of materials	Value of products	Value added by manufacture
BOOKBINDING AND BLANK-BOOK MAKING						
Connecticut:						
1927	11	44	57, 099	38, 255	160, 951	122, 726
1925	12	72	89, 522	83, 580	288, 943	205, 363
Maine:						
1927	5	46	51, 817	53, 745	182, 053	128, 308
1925	7	71	74, 881	67, 395	217, 498	150, 103
Massachusetts:						
1927	81	2, 509	3, 021, 732	2, 515, 919	9, 112, 175	6, 596, 256
1925	82	2, 648	3, 246, 360	2, 896, 274	9, 347, 079	6, 450, 805
Total:						
1927	97	2, 599	3, 130, 648	2, 607, 889	9, 455, 179	6, 847, 290
1925	101	2, 791	3, 410, 763	3, 047, 249	9, 853, 520	6, 806, 271
United States, 1927	1, 063	21, 909	48, 281, 066	25, 875, 185	87, 327, 392	61, 452, 207
PHOTO-ENGRAVING [1]						
Connecticut:						
1927	14	152	334, 270	118, 878	977, 394	858, 516
1925	13	132	292, 737	79, 306	782, 707	703, 401
Maine:						
1927	5	18	32, 635	14, 550	89, 841	75, 291
1925	5	10	17, 349	9, 665	54, 837	45, 172
Massachusetts:						
1927	42	672	1, 407, 282	482, 320	3, 591, 989	3, 184, 960
1925	44	661	1, 316, 651	428, 397	3, 186, 067	2, 757, 670
Total:						
1927	61	842	1, 774, 187	615, 748	5, 274, 972	4, 659. 224
1925	62	803	1, 626, 737	517, 368	4, 023, 611	3, 506, 243
United States, 1927	611	11, 033	28, 381, 480	10, 790, 128	69, 207, 376	58, 417, 248
ENGRAVING AND PLATE PRINTING						
Connecticut:						
1927	5	57	68, 971	86, 084	240, 257	154, 173
1925	5	53	60, 568	62, 870	201, 256	138, 386
Massachusetts:						
1927	22	994	1, 104, 156	1, 484, 248	4, 312, 932	2, 828, 684
1925	21	577	669, 167	715, 897	2, 214, 290	1, 498, 393
Rhode Island:						
1927	4	113	196, 432	25, 097	299, 892	274, 795
1925	4	113	198, 605	32, 605	343, 977	311, 372
Total:						
1927	31	1, 164	1, 370, 723	1, 525, 429	4, 853, 081	3, 327, 652
1925	30	743	928, 340	811, 372	2, 759, 523	1, 948, 151
United States, 1927	393	8, 549	11, 885, 737	10, 236, 216	39, 071, 105	28, 834, 889
LITHOGRAPHING						
Massachusetts:						
1927	10	981	1, 501, 084	1, 753, 674	5, 048, 184	3, 294, 510
1925	11	1, 174	1, 642. 130	1, 916, 281	5, 448, 652	3, 532, 371
United States, 1927	309	16, 348	27, 465, 552	32, 703, 772	97, 050, 124	64, 346, 352

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[1] Not done in printing establishments.

WOOD MANUFACTURES

The wood industries were among the earliest forms of manufacture in New England. One of the first cargoes shipped to England by the colonists was made up largely of clapboards. Many family fortunes in northern New England were made from the sale of pine and spruce timber in the early days. Relics of the activities of those days still persist in the remnants of the old logging towns and sawmill sites which are scattered throughout the former timbered areas. Most of the original growth of New England timber was gone by 1890. The exhaustion of accessible native timber, the use of wood in pulp and paper making, and the cost of transportation have combined to reduce lumbering operations in New England to relatively small proportions. The development of finished wood manufactures in other regions with abundant native timber, such as furniture and turned-wood products in the Central and Southern States, has eclipsed New England manufactures in these lines. While little of the original large supply of softwood timber remains standing, there are adequate resources, particularly in hardwoods, for maintaining certain of the wood-using industries in these States. (See section on forests, pp. 48 to 57.)

The present discussion is confined to the various manufactures involving the cutting and shaping of wood, and does not take account of wood manufactured into pulp and paper products in New England. The wood industries are of particular importance to New England because their basic materials come largely from the native resources of its forests and wood lots. These industries thus afford a market for such materials, particularly to northern New England, and a substantial source of revenue, by turning the standing timber into marketable products.

The total contribution of all the wood-using industries, including primary production and finished wood manufactures, to the manufacturing income of New England in 1927 was approximately $83,000,000. These industries engaged the activities of upward of 37,000 wage earners, who received about $44,400,000 in wages and salaries, provided a local market for materials used in the manufacturing processes amounting to upward of $74,000,000, and turned out products with a gross value in excess of $157,000,000. The prevailing small-scale local operations of these wood industries is indicated by the large number of establishments, aggregating 1,658 plants of all types, with an average value of product per plant amounting to $94,860.

IMPORTANCE OF VARIOUS BRANCHES

The nature of the wood industries and their individual importance in 1927 is shown in the next table, with comparative figures for 1925. A material falling off is noted in the total activity for this group of industries and in most of the individual lines in the 2-year interval. The branches designated as primary wood manufactures, including lumber and timber products, planing-mill products, wooden packing boxes, and cooperage, are the source of approximately one-half of the total manufacturing revenue from the wood industries.

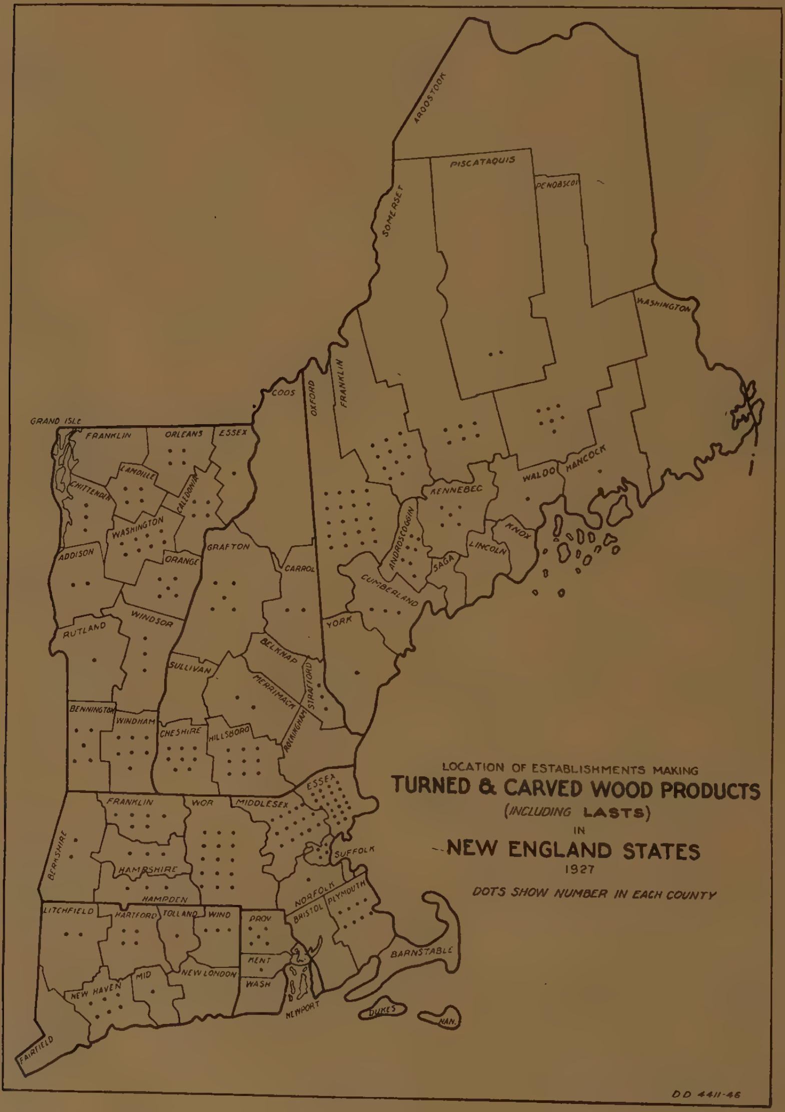
LOCATION OF ESTABLISHMENTS MAKING
TURNED & CARVED WOOD PRODUCTS
(INCLUDING LASTS)
IN
NEW ENGLAND STATES
1927
DOTS SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
HANCOCK
WALDO
KENNEBEC
KNOX
LINCOLN
ANDROSCOGGIN
SAGA
CUMBERLAND
YORK
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
WINDSOR
RUTLAND
SULLIVAN
BELKNAP
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR
MIDDLESEX
BERKSHIRE
HAMPSHIRE
SUFFOLK
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
LITCHFIELD
HARTFORD
TOLLAND
WIND
PROV
KENT
WASH
MID
NEW LONDON
NEW HAVEN
NEWPORT
BARNSTABLE
DUKES
NAN.
FAIRFIELD
DD 4411-46

Figure 44

Wood Industries of New England, 1927 and 1925

Item and year	Establishments	Persons engaged		Thousands of dollars					Per cent (by value added) of all wood industries
		Total	Wage earners	Wages and salaries	Wages	Cost of materials	Value of products	Value added by manufacture	
Primary wood manufactures:									
1927	1, 075	--------	19, 599	--------	22, 517	42, 479	83, 872	41, 392	49. 89
1925	1, 293	26, 977	22, 816	30, 686	25, 920	52, 651	99, 841	47, 191	52. 58
Lumber and timber products—									
1927	621	--------	9, 232	--------	9, 126	14, 417	30, 716	16, 299	19. 65
1925	786	13, 830	12, 487	12, 949	11, 702	20, 330	40, 663	20, 334	22. 65
Planing-mill products—									
1927	319	--------	5, 293	--------	7, 953	15, 105	30, 772	15, 666	18. 88
1925	339	7, 306	6, 031	11, 077	8, 620	18, 242	35, 139	16, 897	18. 83
Wooden packing boxes—									
1927 [1]	107	--------	4, 152	--------	4, 456	10, 634	18, 501	7, 867	9. 48
1925	134	5, 142	4, 664	5, 885	4, 915	12, 274	20, 792	8, 518	9. 49
Cooperage—									
1927 [2]	28	--------	922	--------	982	2. 323	3, 883	1, 560	1. 88
1925	34	699	634	774	682	1, 806	3, 247	1, 441	1. 61
Furniture and similar manufactures:									
1927	346	--------	12, 240	--------	16, 325	24, 585	55, 171	30, 587	36. 86
1925	361	14, 665	12, 784	20, 061	16, 140	25, 079	57, 541	32, 462	36. 17
Furniture—									
1927	273	--------	11, 184	--------	14, 887	21, 902	49, 060	27, 157	32. 73
1925	263	12, 139	10, 713	16, 727	13, 638	20, 862	45, 211	24, 349	27. 13
Caskets—									
1927 [3]	20	--------	525	--------	648	1, 526	3, 210	1, 685	2. 03
1925	26	748	600	1, 006	753	754	4, 000	3, 246	3. 62
Window and door screens—									
1927 [4]	22	--------	158	--------	226	357	853	496	. 60
1925	25	792	643	941	699	1, 654	3, 839	2, 186	2. 44
Refrigerators—									
1927 [4]	11	--------	183	--------	286	434	1, 067	633	. 76
1925	18	664	580	998	746	1, 424	3, 374	1, 950	2. 17
Mirror and picture frames—									
1927 [4]	16	--------	168	--------	250	282	799	517	. 62
1925	24	281	218	346	266	315	921	606	--------
Billiard and pool tables—									
1927 [4]	4	--------	22	--------	28	84	182	99	. 12
1925	5	41	30	43	39	69	195	126	. 81
Wood turning, etc.:									
1927	237	--------	5 425	--------	5, 556	7, 255	18, 243	10, 989	13. 25
1925	232	6, 147	5, 401	6, 805	5, 483	7, 717	17, 901	10, 184	11. 25
Wood turned and carved—									
1927	164	--------	3, 738	--------	3, 553	4, 775	11, 642	6, 867	8. 28
1925 [5]	147	3, 735	3, 366	3, 686	3, 108	4, 383	9, 729	5, 345	5. 96
Lasts, etc.—									
1927 [4]	29	--------	782	--------	1, 072	1, 006	3, 174	2, 168	2. 61
1925	34	1, 214	979	1, 926	1, 387	1, 431	4, 438	3, 008	3. 35
Woodenware—									
1927 [6]	44	--------	905	--------	931	1, 474	3, 427	1, 954	2. 36
1925	44	1, 139	1, 011	1, 132	934	1, 750	3, 494	1, 744	1. 94
Total:									
1927	1, 658	--------	37, 264	--------	44, 397	74, 318	157, 285	82, 968	100. 00
1925 [5]	1, 879	47, 730	40, 956	57, 491	47, 489	85, 293	175, 043	89, 750	100. 00

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[1] Not including Vermont.
[2] Not including Vermont and Rhode Island.
[3] Not including Connecticut, Vermont, and Rhode Island.
[4] Massachusetts only.
[5] Not including 5 establishments in Rhode Island.
[6] Not including Rhode Island.

These industries are of principal importance in northern New England. In the rough-lumber products, Maine, New Hampshire, and Vermont stand out prominently, while Massachusetts and Connecticut are the leading States in planing-mill activities, and Massachusetts and New Hampshire contribute the greater part of the wooden-box manufacture. Products of these primary wood industries enter into local consumption within New England either for building and construction or for packing material and containers. In building and construction New England consumes much more than the area produces.

Rough-lumber and timber production in 1927 contributed about $16,300,000 to the manufacturing income of the region, representing between one-fourth and one-fifth of the total income from all wood manufactures, with a product exceeding $30,000,000 in gross value. This production engaged the activities of 9,232 New England wage earners and paid somewhat over $9,000,000 in wages.

Planing-mill activities contributed to the New England revenue almost as much as the rough-lumber production but employed only a little more than one-half as many wage earners. The planing mills added $15,666,000 to the region's manufacturing revenue, representing in 1927 slightly less than one-fifth of the total for all wood activities. This industry uses some native materials, but it depends largely upon lumber shipped in from outside sources. Massachusetts, the leading State in this activity, contributed almost one-half of the New England total; Massachusetts and Connecticut make up about two-thirds of the total for the whole region.

The making of wooden packing boxes in 1927 contributed a little less than 10 per cent of the revenue from all the wood industries, providing an income of $7,867,000 and engaging the activities of 4,152 wage earners, who were paid $4,456,000 in wages. This activity has its principal importance in Massachusetts and New Hampshire, these two States together comprising about six-sevenths of the total New England revenue from box manufacture. Cooperage manufacture, while of minor importance, contributed upward of $1,500,000 to the region's income, with a product approaching $4,000,000 in gross value.

In addition to the primary wood manufactures included in lumber, planing-mill products, and boxes, the more highly fabricated lines represented by furniture and kindred manufactures and by turned wood and woodenware, represent substantial sources of income to the people of New England, comprising slightly more than one-half of that derived from all the wood industries. This group contributed about $41,500,000 to the manufacturing income, engaged the activities of 17,665 wage earners, paid nearly $22,000,000 in wages, consumed materials which cost nearly $32,000,000, and turned out products with an aggregate value exceeding $73,000,000.

In the finished manufactures, including furniture and other articles which undergo parallel manufacturing processes, such as caskets, window screens, refrigerators, picture frames, and pool tables, wood is an important constituent, although various other materials are included. In 1927 this group contributed 36 per cent of the revenue from all the wood industries of New England, contributed upward of $30,500,000 to the manufacturing income, and engaged the activities of more than 12,000 wage earners who were paid upward of $16,000,000 in wages. Its products had a gross value exceeding $55,000,000. The principal furniture-producing sections of New England are in Northern Massachusetts and southern New Hampshire.

The making of turned products, lasts, and woodenware is also important, contributing nearly $11,000,000 to the manufacturing revenue of New England and making products in 1927 worth upward of $18,000,000. Plants in this line are of particular importance in the State of Maine and in other parts of northern New England, as well as in Massachusetts.

WOOD INDUSTRIES OF INDIVIDUAL STATES

Discussion of the leading items in the wood industries is presented in the pages which follow. Statistics are presented to show the importance of each line in the various States. The aggregate activity of the principal wood-using industries in each State is shown for 1927 and 1925 in the next table.

PRINCIPAL WOOD INDUSTRIES[1] OF EACH STATE, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Massachusetts:							
1927	556	15, 135	20, 375	32, 813	70, 890	38, 076	48. 8
1925	608	16, 071	20, 734	36, 140	74, 266	38, 126	47. 7
Maine:							
1927	307	7, 104	6, 790	10, 361	23, 107	12, 747	16. 4
1925	374	8, 975	8, 169	14, 535	28, 320	13, 785	17. 2
New Hampshire:							
1927	267	5, 448	5, 939	13, 412	23, 662	10, 250	13. 1
1925	301	6, 219	6, 515	13, 981	25, 350	11, 369	14. 2
Vermont:							
1927	206	4, 137	4, 100	5, 485	13, 044	7, 559	9. 7
1925	224	4, 609	4, 244	6, 651	14, 640	7, 989	10. 0
Connecticut:							
1927	170	2, 524	3, 602	5, 134	12, 330	7, 196	9. 2
1925	194	2, 565	3, 465	6, 034	12, 806	6, 772	8. 5
Rhode Island:							
1927	51	938	1, 172	2, 109	4, 259	2, 150	2. 8
1925	43	727	1, 072	1, 838	3, 723	1, 885	2. 4
Total:							
1927	1, 557	35, 286	41, 978	69, 313	147, 292	77, 979	----------
1925	1, 744	39, 166	44, 199	79, 180	159, 104	79, 925	----------
All New England wood industries:							
1925	1, 879	40, 956	47, 489	85, 293	175, 043	89, 750	----------

[1] Lumber and timber products, planing-mill products, boxes, furniture wood turning, and lasts.

LEADING WOOD PRODUCTS

LUMBER AND TIMBER PRODUCTION

The production of timber products resulting from logging-camp and sawmill activities and including (in addition to lumber) lath, shingles, cooperage stock, excelsior, veneer, small-dimension stock, telephone poles, and railroad ties, is prevailingly a business of small-scale operations in New England. A great deal of this activity is carried on by portable sawmills. The business is distinctly seasonal, many producers operating their mills only a few months in the year and supplementing mill activities with logging and other work connected with lumbering. The declining local supply of timber suitable for the general lumber market, in consequence of cut-over stocks, remoteness from transportation, and the wide scattering of the remaining timber in small quantities, together with keen competition from the Pacific coast, the South, Canada, and recently from central and northern Europe, have driven New England lumber out of the large markets. Production is mainly to meet the requirements of local or near-by markets afforded by other wood industries. The importance of lumber and timber activities in each State in 1927 and 1925 is shown in the following table, with comparative New England totals for 1914 and 1904.

Lumber and Timber Production in New England States

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Maine:							
1927	185	3, 898	3, 614	4, 291	10, 664	6, 373	39. 1
1925	238	5, 338	4, 748	7, 597	15, 371	7, 774	38. 2
New Hampshire:							
1927	165	2, 306	2, 500	6, 140	10, 078	3, 938	24. 2
1925	207	3, 289	3, 376	6, 915	12, 622	5, 708	28. 1
Vermont:							
1927	127	1, 652	1, 534	1, 634	4, 552	2, 918	17. 9
1925	151	2, 214	1, 878	2, 580	6, 140	3, 561	17. 5
Massachusetts:							
1927	79	853	909	1, 904	3, 928	2, 024	12. 4
1925	120	1, 211	1, 261	2, 726	5, 183	2, 457	12. 1
Connecticut:							
1927	56	466	521	402	1, 357	955	5. 8
1925	65	385	379	434	1, 184	750	3. 7
Rhode Island:							
1927	9	57	49	46	136	91	. 6
1925	5	50	60	77	163	85	. 4
Total:							
1927	621	9, 232	9, 126	14, 417	30, 716	16, 299	----------
1925	786	12, 487	11, 702	20, 329	40, 663	20, 334	----------
1914	2, 210	23, 154	12, 400	19, 592	45, 205	25, 613	----------
1904	1, 988	24, 047	10, 807	15, 113	38, 212	23, 099	----------
New England as per cent of United States:							
1925	8. 54	2. 63	2. 56	3. 51	2. 86	2. 42	----------

CONDITIONS IN THE INDUSTRY

Number and size of establishments.—Replies regarding conditions in this line during the last few years were received from 83 concerns engaged in rough-lumber production, of which 57 were complete enough for analysis. Of this number 47 companies reported their principal product to be rough lumber, and their aggregate volume of sale in 1925 was $2,279,000. There were five concerns reporting the making of heading and staves for cooperage stock, with an average individual production of $36,200. Four manufacturers of excelsior were included, their average individual sales being $35,750 per plant. Only one company reported shingles as its principal product. The prevailing small scale of lumbering operations in New England is thus apparent.

Of the 47 reporting producers of rough lumber, 31 were located in Maine, 13 in Vermont, and 3 in New Hampshire. The size range among individual plants was as follows: Sixteen companies reported individual sales of less than $10,000 in 1925; 6 between $10,000 and $25,000; 7 between $25,000 and $50,000; 13 between $50,000 and $100,000; and 5 between $100,000 and $300,000. The aggregate sales of 31 plants in Maine, amounting in 1925 to $1,682,000, showed an increase of 23 per cent compared with 1923; while 13 plants in Vermont, with aggregate sales of $422,000, showed a net increase over 1923 of 3.4 per cent. The five producers of cooperage stock, whose aggregate 1925 volume was only $181,000, showed an increase over business in 1923 of 66 per cent. One manufacturer of laths and shingles showed an increase in sales in 1925 of 50 per cent over 1923.

The aggregate sales volume of 33 lumber companies, each of which was less than $50,000, showed an increase in 1925 of 2.3 per cent over the 1923 volume; 16 of the plants showed individual decreases in sales, while 8 increased and 9 had no change. Twelve concerns, whose individual sales ranged in size from $50,000 to $100,000 in 1925, showed a decrease from 1923 of 12.3 per cent; 5 others showed individual increases, while 6 decreased, and 1 indicated no change. Sales of the 7 largest reporting plants, whose operations ranged between $100,000 and $300,000, and whose aggregate sales in 1925 totaled $1,268,000, showed an increase from 1923 of 22.1 per cent; 5 of these large companies showed individual increases, while the other 2 had a falling off in sales.

On the basis of 1925 capacity, 4 companies reported operating at 100 per cent; 4 others between 80 and 95 per cent; 23 others between 50 and 80 per cent; while there were 14 concerns operating at less than one-half their capacity, of which 10 were running at 25 per cent or below. Regarding seasonal employment, 22 concerns stated that their normal period of production was from 2 to 6 months of the year, 22 others reported activities extending from 7 to 9 months, 4 concerns reported activities 10 months of the year, and 4 others stated that they had year-round activity.

Distribution of markets.—Thirty-eight companies stated that their entire sales were made within New England. Of these, 22 were located in Maine, 14 in Vermont, and 2 in New Hampshire. Fifteen other companies reported that they sold upward of one-half of their product in New England, while 3 others stated that New England sales were one-fourth or less of their output. Of the total number reporting, 23 concerns stated that their sales in the New England market were decreasing, while 14 reported an increase in New England sales. The principal reasons given for declining sales in New England were the competition from outside sources and changes in local demand. Labor costs were also emphasized in many instances, while quite a number attributed a falling off in business to overproduction. Of the companies reporting sales increases several mentioned the development of new products and the extension of selling territory. Reduction of manufacturing costs was reported by 5 companies, and the application of new sales methods by 2 concerns.

Marketing methods.—The majority of these companies report direct sales to the consumer or user, either wholly or in conjunction with other outlets. Eleven companies stated that they market their entire product in this way; 26 concerns reported the employment of selling agents and 7 depend upon these exclusively; 25 others reported sales of all or a portion of the production through wholesale dealers.

National advertising mediums were indicated in 4 instances and local mediums in 8 others. Direct mail and newspapers are most frequently used.

The attitude of New England manufacturers of lumber is well indicated by some of the individual comments. A large Vermont producer states: "Pacific coast lumber is laid down in Boston cheaper than we can lay it down by rail. Labor conditions and high freight rates absorb practically all that we can get out of lumber. Southern lumber is also a very strong competitor."

A New Hampshire lumberman states: "Lumber from Idaho and the Pacific coast is coming to New England at prices that prevent the sale of New Hampshire pine at even a fair price." This man, whose business has been on the increase during the last few years, credits the increase to long-time contracts and to new methods of sale. A manufacturer in eastern Maine states: "Increased competition from the west coast and Canada has limited us to low-cost hauls." Another large producer of spruce and pine lumber states that the low price of Pacific coast lumber has forced Maine spruce lumber out of the metropolitan district and other Atlantic coast points.

On the other hand, one New Hampshire lumberman reports that he has kept up his volume of business by adding the construction of apple boxes and of tanks during the slack season of the year. Another substantial New Hampshire manufacturer of hardwood heading and hardwood lumber, whose sales are made through wholesale houses, credits increased sales to "activity and sales advertising." A Maine producer whose business has shown a substantial increase credits this to the standardization of products, stating, "We have never lost a customer after securing him. We always deliver the same quality of product that we describe and fill orders promptly." This concern advertises wholly by direct mail. Another medium-sized producer of lumber and spool stock in Maine credits the maintenance of sales volume to the satisfaction of customers resulting from his efforts to maintain uniform grades in the lumber sold. A medium-sized concern, also in Maine, whose sales volume has been practically uniform since 1921, states that the decrease in its production of manufactured native lumber has been offset by an increase in secondary products, such as cedar posts, poles, and ties.

THE LUMBER MARKET OF NEW ENGLAND

NOTE.—The section entitled "The Lumber Market of New England" (pp. 489–496) was prepared by Edwin Bates of the Domestic Commerce Division.

During the past three decades New England has become more and more dependent upon outside sources for its supply of building lumber. Previous to 1890 requirements were met mainly from local production, but the reduction of timber areas in these States, the demands of the paper and pulp industry, and the consequent decrease in lumber production have opened up a market for producers in eastern Canada, in the southern and western parts of the United States, and in British Columbia.

In analyzing the New England market one of the chief difficulties arises from inability to break up statistical data to distinguish between lumber for construction purposes and material for the woodworking industries. Statistical reports of the transportation agencies do not differentiate sufficiently among the several types of forest products to throw light upon the extent of building requirements, compared with the demand for box material or for other wood-using industries. In the present study it is necessary, therefore, to deal only with the general movement of lumber into New England, and with the more outstanding developments in its distribution. Certain major changes of recent years which are well recognized by the trade are also set forth.

SOURCES OF NEW ENGLAND LUMBER

The chief present sources of softwood building lumber for New England consumption, aside from the local and Canadian supplies of pine and spruce, are the southern pine districts and the Pacific coast of the United States and Canada. Hardwoods for flooring, interior finish, and doors come from the Lake States, southern Appalachian territory, and the Southern and Gulf States.

The figures in the following table, covering shipments of lumber in 1924 and 1926, as published by the United States Forest Service with the cooperation of the Bureau of the Census, shed considerable light on the present general lumber movement into New England. The figures are not final, however, as they presumably cover only first billings of shipments and do not account for rebilling from large primary markets in the East to points of final destination in New England.

Southern pine has in recent years been losing its position in the New England market, largely as a result of the increased shipments of Pacific coast lumber through the Panama Canal. This shift has been particularly true in the class known as structural timbers, which are used largely in the construction of trestles, bridges, and factory buildings where strength is the main essential. A similar shift has taken place in general building lumber. These changes have come about largely because of a lower delivered price on the Pacific coast product.

Maine and Vermont are the two New England States which possess a surplus of available timber. Although the producers of spruce lumber in Maine naturally look upon New England as a home market, they have more and more found themselves at a disadvantage in selling against Pacific coast competition. On one hand, the producer of spruce lumber has to compete with the pulp producer, because the price of spruce stumpage is governed largely by the demand for pulpwood; on the other hand, he must face competition in the price at which the Pacific coast producer can deliver lumber by water in the metropolitan centers, such as Boston and Providence. Transportation costs are an important factor in the competition of the Maine producer, who is almost entirely dependent upon rail shipment.

The Pacific coast producer, whose timber is located near tidewater, with the all-water route from Pacific coast ports to New England, is in a more favorable position.

DOMESTIC SHIPMENTS OF SOFTWOOD AND HARDWOOD LUMBER INTO NEW ENGLAND STATES, BY REGION OF ORIGIN, 1924 AND 1926

[To first destinations only: Redistribution not shown. Thousand feet, board measure, i. e., 000 omitted]

Region and year	Connecticut	Maine	Massachusetts	New Hampshire	Rhode Island	Vermont	New England total
Northeastern:[1]							
1926	77, 887	138, 628	274, 346	162, 569	21, 970	72, 740	748, 140
1924	86, 436	177, 928	325, 560	140, 798	21, 515	77, 820	830, 057
Lake:							
1926	1, 042	195	5, 007	501	131	238	7, 114
1924	1, 360	46	4, 940	24	63	71	6, 504
Central:							
1926	2, 912	1, 203	20, 665	489	2, 674	823	28, 766
1924	9, 680	493	25, 702	1, 380	2, 712	1, 039	41, 006
North Carolina pine:							
1926	28, 956	2, 976	79, 028	1, 404	5, 340	1, 024	118, 728
1924	47, 124	7, 105	88, 549	5, 666	6, 418	890	155, 752
Southern pine:							
1926	46, 322	14, 496	159, 061	13, 143	37, 417	9, 655	280, 094
1924	68, 507	22, 270	207, 797	18, 247	41, 599	12, 037	370, 457
Pacific (north):							
1926	62, 885	8, 633	135, 934	9, 213	59, 590	11, 052	287, 307
1924	46, 690	9, 379	85, 886	4, 862	18, 370	6, 916	172, 103
Pacific (south):							
1926	4, 903	1, 499	14, 941	2, 555	1, 584	516	25, 998
1924	5, 197	762	11, 792	2, 163	1, 336	889	22, 139
Rocky Mountain (north):							
1926	20, 259	615	20, 931	3, 124	1, 266	551	46, 746
1924	27, 245	664	26, 770	2, 418	3, 639	1, 243	61, 979
Rocky Mountain (south):							
1926	33	163	122	----------	----------	----------	318
1924	----------	240	----------	----------	----------	----------	240
Prairie:							
1926	238	----------	239	----------	239	----------	716
1924	101	----------	324	----------	----------	----------	425
Total, all regions:[1]							
1926	245, 437	168, 408	710, 274	192, 998	130, 211	96, 599	1, 543, 927
1924	292, 340	218, 887	777, 320	175, 558	95, 652	100, 905	1, 660, 662

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[1] Includes intrastate distribution—i. e., the quantity of lumber sawed and distributed within each State of New England.

IMPORTS OF LUMBER

The New England States are heavy buyers of Canadian lumber for construction purposes. Relatively small imports are recorded from northern Europe. During the years 1924 to 1926, inclusive, the New England market imported annually an average of around 520,000,000 board feet of softwood lumber.

While much of this material was used in construction, a certain percentage was consumed in the manufacture of boxes and crates. Statistics show that the bulk of the imports was entered in the Maine, New Hampshire, and Vermont customs districts. It is doubtful, however, whether much of the consumption actually took place in these northern States, as the demands for construction material are concentrated largely in the southern New England district. These purchases, being mainly from Canada, were entered at customs offices on the Canadian border, and most of the shipments were probably destined to points in southern New England.

Imports of lath and shingles from Canada into the New England States average annually over 400,000,000 of each. No imports of these from other countries are shown in the records of the customs districts. Imports of lath and shingles from Canada exceed considerably the local New England production, as indicated by reports of lumber producers to the Bureau of the Census.

The production of lath reported in the six New England States in 1926 totaled 169,751,000 and that of shingles was only 61,548,000, both confined almost entirely to the State of Maine. Figures of receipts of lath and shingles from other sections of the United States are not available. The annual imports of softwood lumber and of lath and shingles from 1924 to 1927, inclusive, into each of the five customs districts comprising the New England States, are shown in the following table.

IMPORTS OF SOFTWOOD LUMBER, LATHS, SHINGLES, AND RAILROAD TIES INTO NEW ENGLAND CUSTOMS DISTRICTS, 1924–1927

Item and year	Maine and New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut	Total
Boards, planks, deals, etc., of softwood (thousand feet):						
1927	175, 064	178, 527	91, 727	18, 060	17, 706	481, 084
1926	184, 100	205, 946	114, 544	4, 718	12, 959	522, 267
1925	204, 079	226, 868	85, 465	12, 672	10, 981	540, 065
1924	222, 946	179, 617	68, 508	15, 098	11, 387	497, 556
4-year total	786, 189	790, 958	360, 244	50, 548	53, 033	2, 040, 972
Laths (thousand):						
1927	210, 371	108, 394	8, 229	1, 800	6, 797	335, 591
1926	256, 821	131, 519	7, 062	2, 667	6, 947	405, 016
1925	313, 684	113, 352	9, 340	148	3, 637	440, 161
1924	334, 609	119, 076	6, 850	1, 591	1, 995	464, 121
4-year total	1, 115, 485	472, 341	31, 481	6, 206	19, 376	1, 644, 889
Shingles (thousand):						
1927	133, 294	181, 122	1, 359	9, 138	760	325, 673
1926	134, 218	228, 146	8, 228	2, 535	2, 530	375, 657
1925	101, 120	266, 164	16, 440	16, 776	1, 000	401, 500
1924	107, 963	290, 947	10, 495	27, 267	400	437, 072
4-year total	476, 595	966, 379	36, 522	55, 716	4, 690	1, 539, 902
Railroad ties:						
1927	208, 623	205, 365	120, 030	(1)	(1)	534, 018
1926	118, 486	403, 630	88, 994	(1)	(1)	611, 110
1925	55, 420	427, 627	24, 442	(1)	(1)	507, 489
1924	158, 711	315, 851	3, 980	(1)	(1)	478, 542
4-year total	541, 240	1, 352, 473	237, 446	----------	----------	2, 131, 159

[1] Not given.

SEASONALITY OF SHIPMENTS

There is no trade organization in New England at present collecting statistics on the combined receipts of lumber by water and by rail at any of the consuming markets. In the past the Boston Chamber of Commerce, and later the Boston Flour and Grain Exchange, collected such statistics for Boston, but figures have not been compiled since the latter part of 1924. The large number of terminals scattered throughout the Boston port area makes it difficult to collect complete statistics on lumber receipts. Figures of monthly receipts for the years 1922 and 1923 are reproduced below, indicating the seasonality of recorded receipts in these two years. Figures of water receipts of lumber at certain New England ports from ports on the Pacific coast, as published by the United States Shipping Board, are reproduced in the second table.

TOTAL MONTHLY LUMBER RECEIPTS AT BOSTON, 1922 AND 1923

[Report of the Boston Flour and Grain Exchange]

Month	1922	1923	Month	1922	1923
	Board feet	*Board feet*		*Board feet*	*Board feet*
January	7, 383, 551	18, 843, 254	August	18, 355, 326	21, 130, 582
February	8, 125, 154	7, 543, 898	September	11, 884, 104	24, 771, 190
March	16, 705, 765	15, 060, 559	October	15, 422, 657	24, 942, 871
April	17, 765, 713	17, 877, 015	November	11, 618, 748	18, 942, 668
May	16, 380, 128	22, 937, 419	December	14, 534, 474	13, 612, 276
June	10, 630, 835	23, 512, 102			
July	14, 792, 500	28, 780, 820	Total	163, 598, 955	237, 954, 654

RECEIPTS OF PACIFIC COAST LUMBER AT NEW ENGLAND PORTS, YEARS ENDED JUNE 30, 1925 TO 1928

[Based on reports of the U. S. Shipping Board; all figures in cargo tons of 2,240 pounds]

New England ports	From California ports	From Oregon ports	From Washington ports	Total
Portland, Me.:				
1928	(1)	1, 789	7, 955	9, 744
1927	(1)	1, 858	1, 747	3, 605
1926	265	495	1, 730	2, 490
1925	338	110	896	1, 344
Boston, Mass.:				
1928	542	59, 534	140, 735	200, 811
1927	2, 090	26, 609	124, 900	153, 599
1926	991	28, 223	116, 927	146, 141
1925	957	15, 424	85, 063	101, 444
Providence, R. I.:				
1928	(1)	24, 077	52, 796	76, 873
1927	(1)	22, 332	32, 557	54, 889
1926	(1)	33, 308	66, 104	99, 412
1925	(1)	27, 459	51, 990	79, 449
Portsmouth, R. I.:				
1928	(1)	(1)	57, 132	57, 132
1927	(1)	(1)	51, 303	51, 303
1926	(1)	(1)	31, 125	31, 125
1925	(1)	(1)	(1)	(1)
New London, Conn.:				
1928	(1)	4, 498	1, 610	6, 108
1927	(1)	3, 603	40	3, 643
1926	(1)	885	1, 414	2, 299
1925	(1)	7, 178	4, 586	11, 764
New Bedford, Mass.:				
1928	(1)	24, 077	52, 796	76, 873
1927	(1)	(1)	2, 317	2, 317
1926	(1)	(1)	(1)	(1)
1925	(1)	(1)	(1)	(1)
Total:				
1928	542	113, 975	313, 024	427, 541
1927	2, 090	54, 402	212, 864	269, 356
1926	1, 256	62, 911	217, 300	281, 467
1925	1, 295	50, 171	142, 535	194, 001

[1] Not given.

RECENT CHANGES IN LUMBER TRADE

The New England lumber market is being supplied more and more by seasoned and dressed lumber. Since rail rates on lumber are based upon weight, while sales are based upon the number of board feet, the reduction in weight from seasoning constitutes a saving of from 15 to 25 per cent in the rail freight bill. This fact has had a direct bearing upon the place of kiln drying for the New England market. A further reduction in weight is made by surfacing the lumber before shipment.

SASH, DOORS, AND INTERIOR TRIM

New England producers of sash, doors, and interior trim in recent years have found increasing difficulty in maintaining their position in the local market. The principal handicap of the New England producer arises from the fact that with these products the economical grades for cutting are much more efficiently utilized when worked near the lumber-producing sections. Increased freight rates in recent years have increased the production of this class of work nearer the lumber-producing centers, as is shown by the growth of the millwork business in the Middle West, South, and West. The New England market is now supplied with doors and interior trim largely from these regions. Pacific coast doors have been sold in the New England market for a number of years. A marked increase, however, is reported by the trade within the past 5 or 10 years.

FLOORING

Flooring constitutes one of the principal uses for hardwood lumber in building construction. Maple and oak are the important kinds of wood used for this purpose. The supplies come largely from producing territory in the Lake States, Middle West, and Southern States. Maple, southern pine, and oak have been strong competitors in the New England market. In very recent years southern pine and oak flooring have sold at practically the same price. Under such a condition buyers have been inclined to favor the oak flooring. Companies which handle maple flooring generally also handle maple for use in the wooden-heel and other industries throughout the New England States. The manufacture of flooring has shifted more and more to the producing regions, and New England planing mills have made up less and less of the finished flooring used in these States.

RAILROAD TIES

Conservative estimates by the trade place the consumption of railroad ties in New England at 3,000,000 annually. Local production of ties is declining, particularly in the southern part of the region. The southern-pine tie has a large part of the market, especially on the southern New England lines.

Import statistics show that New England holds first place among United States consumers of imported railroad ties.

NEW ENGLAND IMPORTS OF RAILROAD TIES, 1924–1927

Year	Number	Value	Per cent of United States total
1924	478, 542	$306, 850	46
1925	507, 489	448, 000	44
1926	611, 110	623, 910	49
1927	534, 018	495, 450	49

Practically all the ties imported into the New England States are from Canada. They are used principally by the Canadian lines which enter the New England States and by American railways extending into Canada.

MERCHANDISING OF LUMBER

Lumber merchandising is in the hands of commission dealers, wholesalers, and retail merchants. The commission dealer in the New England lumber trade is now engaged largely in the handling of Pacific coast lumber. In arranging for a shipment of Pacific coast lumber the commission dealer undertakes to pay transportation charges and cost of handling at the terminal market and makes sales on a commission basis. He expects to make sales previous to the arrival of the cargo with the understanding that the lumber will be accepted by the buyer at ship's side.

Facilities for the storage of lumber by wholesalers at the principal consuming centers of New England have heretofore been limited, particularly at Boston. In recent years the facilities for storage at Boston have been considerably increased by the construction of a special lumber terminal at Charlestown. There has been an important lumber terminal at Harbor Junction, Providence, for several years. Another lumber terminal was recently constructed at Portsmouth, R. I., which is so situated as to be a base for supplying much of the trade of southern New England.

There are a number of wholesale lumber companies with sales offices in Boston which maintain no stocks in that market but ship entirely on orders received from contractors and retail yards. The rental of desirable space on rail or water sidings, together with the cost of trucking from warehouse to point of use, increases the cost of handling very materially. Some wholesalers avoid the storage charges incident to carrying stocks, also the expense of kiln-drying, by buying only seasoned and finished lumber and shipping it to market entirely upon order. Improved transportation services have been another factor in this plan of merchandising.

In a hearing before the Interstate Commerce Commission in 1926 a large wholesale firm with storage facilities at Providence and Poughkeepsie stated that 63.5 per cent of its lumber receipts at these ports went direct from ship's side to railway cars for shipment to interior points, and that only 36.5 per cent went into storage.

The retail demand for lumber throughout New England is supplied almost entirely by local retail yards. The chain lumber yard has had a limited development, and, so far as can be learned, only two or three chains are now in operation. Apparently the principal difficulty in establishing a chain of lumber yards has been the consumer preference for the local retail lumberman who has had a business established for a number of years. The selling of lumber by mail order to small consumers was not observed to be of great consequence in New England. Ready-cut houses have been limited in sale mainly to use as summer homes at vacation resorts.

The lack of fundamental marketing information is a condition deplored by the lumber trade generally. There is apparently no information available at any of the principal consuming markets with reference to the anticipated receipts or demands for lumber at future periods. So far as can be learned, no systematic effort is made to obtain data relative to shipments of lumber to New England. As a result, prices have been made largely in ignorance of the stocks available for sale at the time when delivery is expected.

This lack of information on the future course of market supply is rather definitely reflected in the price situation existing in the retail trade. During 1926 one of the lumber-trade organizations in Boston made a study of prices existing at the same time on definitely stated grades of lumber at different retail yards in the metropolitan area. The results of that study indicated that for a similar grade of lumber of the same dimensions and in equal quantities prices varied as widely as 15 to 30 per cent in different yards.

In the past the lack of storage facilities at such points as Boston has necessitated the immediate sale of cargoes remaining unsold upon arrival. The result was that a great deal of "distress lumber" was placed upon the market, and a buyer's market resulted—a condition that might obtain at almost any time. The development of storage space at the lumber terminals has operated to offset this situation to some degree. The commission receiver, however, is interested largely in immediate sale, and hence there is a tendency to make sales at such prices as can be immediately secured.

The influence of storage facilities upon prices is a matter of direct interest to the retail lumber trade. In so far as storage facilities reduce the uncertainties of price making, the retail trade is definitely benefited. Retailers, however, commonly criticize the establishment of large wholesale yards, in so far as they promote the trade of the small retailer who secures orders with the expectation of filling them directly from the wholesalers' stock, thus avoiding to a large degree the risks from price declines. Retailers who carry regular stocks feel that they deserve protection from the small retailer who uses the wholesale yards as a base of supply.

DISTRIBUTION OF LUMBER FROM PORT CITIES

The port cities of New England, enjoying the advantage of location at tidewater and consequent low transportation rates, serve as bases for the distribution of lumber to interior points. Boston and Providence have an unmistakable place as distributing centers for much of New England. New York also serves for the lower Connecticut section. Smaller port cities, such as New Haven, New London, Fall River, New Bedford, Portsmouth, N. H., and Portland, receive cargoes of Pacific coast lumber, which satisfy not only their local requirements but are in turn distributed by rail and highway to interior points.

Within the last few years a new lumber terminal has been constructed at Portsmouth, R. I., about 30 miles south of Providence, intended as a base of trade for a wide section of Massachusetts, Rhode Island, and Connecticut. Another center of importance to the New England lumber trade is Poughkeepsie, in New York State, which also has the advantages of location on navigable water. At Poughkeepsie a large lumber distributor has yards, from which orders are filled for points in western Massachusetts and Connecticut.

In recent hearings before the Interstate Commerce Commission officials of the New Haven Railroad presented the following figures on shipments from Harbor Junction Wharf (at Providence), Poughkeepsie, and Boston, to points on the New Haven & Central Railroad of New England, the Boston & Albany, and the Boston & Maine

Railway. This information was obtained previous to the opening of the Portsmouth terminal. These figures indicate the increasing importance of Poughkeepsie and Providence in lumber distribution. Allowance in all cases must be made for the uncertain volume of truck-borne shipments. From all the ports of New England there is considerable shipment of lumber by highway. In the hearings referred to, the general freight agent of the New Haven estimated that 1,400 cars of lumber were trucked from Providence to outlying points each year. This was estimated to be 70 per cent of the rail movement from this point.

ANNUAL LUMBER SHIPMENTS TO POINTS ON THE NEW HAVEN, THE CENTRAL RAILROAD OF NEW ENGLAND, THE BOSTON & ALBANY, AND THE BOSTON & MAINE RAILROAD, 1921–1925

Shipped from—	Cars	Net tons
Harbor Junction (Providence):		
1921	22	442
1922	163	3, 654
1923	849	21, 839
1924	1, 422	34, 408
1925	2, 281	53, 248
Poughkeepsie:		
1921	374	8, 107
1922	144	3, 243
1923	859	18, 913
Poughkeepsie—Continued.		
1924	697	16, 871
1925	860	20, 261
Boston:		
1921	392	7, 107
1922	400	7, 753
1923	1, 229	26, 580
1924	2, 798	57, 899
1925	3, 755	76, 745

LUMBER STANDARDS

The diversity of lumber standards has constituted one of the serious problems in lumber merchandising, not only in New England but throughout the entire country. The uncertainties imposed upon the trade by varying specifications has been a subject of serious study by the Department of Commerce in cooperation with the lumber trade.

Through conferences between the department and producers and distributors throughout the country, a series of specifications known as the American lumber standards has been developed, and these standards have been adopted by a substantial number of prominent lumber manufacturers throughout the country.[1] The New England lumber trade, in harmony with lumber interests throughout the country, has given a favorable response to these standards. According to a survey made in February, 1927, 80 per cent of the orders placed with manufacturers by retailers in the northeastern section of the United States were for lumber produced according to the American lumber standards. The report showed a substantial increase over that of the corresponding month of the previous year.

The sentiment of the lumber trade in New England, as expressed in conference with representatives of the Department of Commerce, is definitely in favor of a program which will eliminate misunderstanding between buyer and seller and thus obviate the cause of numerous disputes and the litigation which has so often followed.

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[1] Revised Simplified Practice Recommendation No. 16, "Lumber," may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 15 cents. The department, through its Bureau of Standards, has also collated all the important sets of specifications for all wood products which to-day have more than local application. This is available as Bureau of Standards Miscellaneous Publication No. 79, "Standards and Specifications in Wood-Using Industries." Price, $1.50.

MILLWORK AND PLANING-MILL PRODUCTS

The principal activities of millwork plants are the making of sash, doors, window frames, molding, interior finish, architectural woodwork, store fixtures, and general millwork. In addition to these the specialized products include a considerable variety of articles, such as portable and sectional buildings, office partitions, store counters, wood mantels, foundry riddles, refrigerator and furniture stock, hardwood lumber, and flooring. Many of the plants which make these products are operated by concerns engaged in contract building or construction, or in conjunction with a retail lumber business. A considerable proportion makes products on special orders or under contract.

RAW MATERIALS AND FINISHED PRODUCTS

The principal material used in this industry is lumber, chiefly of white pine, yellow pine, fir, cypress, spruce, oak, and maple. In northern New England the mills adjacent to native lumber supplies report the use of native white pine, spruce, and maple, but in other sections the mills depend to a very large extent upon lumber that is shipped in from the West and the South. The principal raw materials other than lumber are veneer, glass, paint, glue, and various kinds of hardware. With the exception of glass, most of these materials are obtained from New England sources. The importance of planing-mill activities in the various States of New England is shown for 1927 and 1925 in the following table, with comparative totals for 1914 and 1904. Substantial reduction is noted in the 2-year interval in each State except New Hampshire, where there was considerable increase.

PLANING-MILL PRODUCTS IN NEW ENGLAND STATES, 1927 AND 1925

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Massachusetts:							
1927	147	2, 298	3, 876	6, 595	14, 138	7, 543	48. 1
1925	145	2, 628	4, 211	8, 062	16, 457	8, 395	49. 7
Connecticut:							
1927	62	967	1, 503	2, 489	5, 484	2, 994	19. 1
1925	76	1, 247	1, 818	3, 593	7, 031	3, 438	20. 3
New Hampshire:							
1927	32	770	956	1, 963	3, 856	1, 893	12. 1
1925	30	651	725	1, 862	3, 299	1, 437	8. 5
Maine:							
1927	36	499	618	1, 621	2, 952	1, 331	8. 5
1925	41	519	635	1, 749	3, 066	1, 317	7. 8
Rhode Island:							
1927	22	386	573	1, 136	2, 227	1, 091	7. 0
1925	24	429	690	1, 135	2, 431	1, 296	7. 7
Vermont:							
1927	20	373	428	1, 301	2, 114	813	5. 2
1925	23	557	541	1, 841	2, 854	1, 013	6. 0
Total:							
1927	319	5, 293	7, 953	15, 105	30, 772	15, 666	
1925	339	6, 031	8, 620	18, 242	35, 138	16, 896	
1914	464	7, 343	4, 951	13, 853	22, 954	9, 101	
1904	451	7, 012	3, 903	10, 806	18, 469	7, 663	
New England as per cent of United States:							
1925	7. 12	5. 42	5. 88	4. 52	4. 94	5. 49	

CHANGES IN SALES SINCE 1921

Replies from 73 concerns engaged in the manufacture of various planing-mill products were analyzed regarding changes in their sales since 1921. The size of business represented by these was as follows:

	Number of companies
$20,000 to $50,000	29
$50,000 to $100,000	16
$100,000 to $200,000	11
$200,000 to $500,000	15
Over $500,000	2

Of these 73 companies there were 45 whose individual sales volume since 1923 showed an increase, while 28 showed a decrease. Most of the individual increases ranged from 2 to 50 per cent; one Massachusetts concern making a special product had an increase of 75 per cent and another company an increase of 100 per cent. Decreases since 1923 ranged, in individual cases, from 3 to 40 per cent. As a general rule, the most marked increases in sales were shown by companies making a special product. In numerous instances these companies had added the development of high-grade interior woodwork to their general line of manufacture.

Reasons most frequently given for larger sales were the increase in building activity, the adoption of new sales methods, and the extension of selling territory. The pushing of new products, such as portable houses and sectional buildings, and the addition of interior finish were credited in several instances with increased business. On the other hand, some concerns stated there had been a recession in building activity which had caused a falling off in business. Numerous replies referred to the increased competition from other sections of the country, particularly that of finished lumber from the Western and Southern States. A number of replies referred to the high cost of labor and of materials as a factor which has made them unable to compete with lower-priced products from other parts of the country. The increased use of steel in office buildings and hotels is said by one manufacturer to have cut deeply into the market for architectural woodwork. A mill owner in Vermont expressed the need for a market for the poorer grades of lumber and for wood of smaller dimensions.

As reported by 68 establishments 41 concerns reported working at full or nearly full capacity in 1925. Of the other 27 there were 23 reporting between 50 and 80 per cent, and 4 below 50 per cent of capacity.

METHODS OF MARKETING

Practically all the reporting companies stated that they deal directly with the consumers, either wholly or in part. Twenty-two concerns stated that they sell to wholesale dealers and 21 to retailers, while 12 concerns reported the employment of sales agents and 5 others have exclusive distributors handling their products. As most of these manufacturers cater to a local market their advertising is done principally through local mediums in which the newspaper is the principal one used.

CHANGES IN VOLUME OF BUSINESS

Analysis of the changes in volume of business by establishments of different sizes shows that those in the middle rank, ranging in volume of sales between $100,000 and $300,000 showed, in general, a definite increase in business from 1923 to 1925, while both the smaller establishments and the larger establishments showed, in the aggregate, a decrease in this period. In the case of the larger companies the decrease may be explained in part by the fact that their figures probably include a considerable portion of lumber retailing.

The aggregate sales of 43 plants with individual business below $100,000 showed a decrease of 3.7 per cent from 1923 to 1925, and the aggregate for 10 large establishments each exceeding $300,000 showed a decrease of 6.8 per cent; but the aggregate for 34 establishments with individual sales between $100,000 and $300,000 showed an increase of 6.5 per cent.

The activities of millwork establishments differed materially according to the line of goods manufactured. The increase in business from 1921 to 1925 was most consistent with the makers of sash, doors, window frames, and similar products used in the construction of dwellings. The aggregate sales of 20 companies in this line of business showed an increase from 1921 to 1923 of 39 per cent, and from 1923 to 1925 an increase of about 5 per cent. There were 39 concerns in a group whose product was interior and exterior trim, molding, stair work, mantels, and grill work, whose aggregate sales increased from 1921 to 1923 by 27 per cent, but showed a slight decrease, less than 2 per cent, in 1925. General millwork, dressed lumber, and hardwood flooring, as represented by 20 companies, showed the least increase—24 per cent—from 1921 to 1923, and the greatest decrease—6 per cent—in 1925. The manufacturer of miscellaneous products, such as office partitions, store fixtures, and sectional and portable buildings, as represented by eight companies, had an increase of 32 per cent up to 1923 and a decrease of about 5 per cent in 1925.

According to individual States, 6 New Hampshire companies led, with an aggregate increase in business of 19 per cent from 1923 to 1925; while 20 establishments in Connecticut showed an increase of 4 per cent, and the 38 in Massachusetts increased 2 per cent in the same period. On the other hand, the aggregate sales of the 15 establishments reporting from Vermont showed a decrease of about 8 per cent, 7 concerns in Maine fell off 6 per cent, and 1 large establishment in Rhode Island showed a decrease of 15 per cent from 1923 to 1925.

WOODEN PACKING BOXES

The packing-box industry is based chiefly on native raw materials, of which white pine is the principal wood used. Being tight-knotted stock free from resin, so that it takes printing readily, New England pine finds in this use a market that does not suffer serious competition from shipped-in lumber. The box industry provides an outlet for small and second-growth timber that can not be sawed into lumber for construction purposes. New England timber grows to merchantable size for boxes in about 45 years, while construction lumber requires 65 years to reach maturity.

The principal market is within New England and comes from the packing requirements of its manufacturing industries. There is thus a fairly stable and permanent market close at hand. The logical market limits are the New England States, New York State, and Pennsylvania, in which the New York metropolitan area provides an important outlet.

CHANGES IN CONSUMPTION

This New England industry has suffered severely in recent years from the reduced consumption resulting from substitution of boxes made of fiber, and to some extent of veneer and plywood. The decline in the use of pine boxes as containers since the war is estimated by a prominent box manufacturer to have been from 30 to 50 per cent of their previous use. The consumption of lumber for box manufacture in New Hampshire in 1925, however, was approximately the same as in 1912, which indicates that recent estimates of decline are on the basis of war-time consumption. The decline of the last few years has eliminated many small, country box-making shops and has curtailed the production of boxes by other makers of lumber products.

The making of wooden packing boxes by establishments specializing in this line represented 9.5 per cent of the total revenue from the New England wood industries in 1927, and the value of the output was 13.6 per cent of the national total. The industry added a little less than $8,000,000 to the region's manufacturing revenue, provided a market for materials exceeding $10,600,000, paid $4,456,000 in wages to 4,152 wage earners, and turned out a product with a gross value of $18,500,000.

A survey of the New England wooden-box industry made for the New England Council by the Harvard Forest in 1926, covering 155 box manufacturers, indicated an aggregate capital investment of $10,635,000 in plant and machinery, a consumption of 432,700,000 feet of lumber costing $12,222,000, and aggregate sales in 1925 of $20,591,000.

More than 80 per cent of the New England output of wooden packing boxes comes from two States—Massachusetts and New Hampshire. The product of the latter State in 1927 exceeded $6,000,000 in value, while that of Massachusetts was approximately $9,300,000. The industry is also of some importance in Maine, the production of that State exceeding $2,100,000. These three States produce more than 90 per cent of the New England output. The following table gives figures for the individual States for 1927 and 1925, with comparative totals for 1914 and 1904. These figures, however, cover only the specialized establishments, reported in the census, which make boxes for sale as their main product. In addition to these, numerous lumber companies make boxes and shooks as a secondary product, and many manufacturers in other industries buy shooks from lumber mills and make up boxes from purchased materials for their own use. For New England as a whole the figures show a general falling off in activity in the last 2-year interval, but in New Hampshire it increased substantially.

WOODEN PACKING BOXES (EXCEPT CIGAR BOXES) IN NEW ENGLAND STATES, 1927 AND 1925

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Massachusetts:							
1927	59	2, 062	2, 316	5, 116	9, 307	4, 190	51. 3
1925	72	2, 428	2, 689	6, 245	11, 187	4, 942	58. 0
New Hampshire:							
1927	25	1, 376	1, 376	3, 689	6. 087	2, 398	30. 5
1925	27	1, 229	1, 294	3, 542	5, 768	2, 226	26. 1
Maine:							
1927	10	543	531	1, 298	2, 126	828	10. 5
1925	15	673	606	1, 696	2, 593	897	10. 5
Rhode Island:							
1927	7	120	139	329	597	269	3. 4
1925	7	152	179	385	618	233	2. 7
Connecticut:							
1927	6	51	94	201	384	183	2. 3
1925	7	31	33	236	313	77	. 9
Vermont:							
1925	6	151	115	169	313	144	1. 7
Total:							
1927 [1]	107	4, 152	4, 456	10, 634	18, 501	7, 867	----------
1925	134	4, 664	4, 916	12, 273	20, 792	8, 519	----------
1914 [2]	----------	5, 664	2, 945	9, 132	14, 456	5, 325	----------
1904	231	6, 179	2, 756	7, 473	12, 502	5, 029	----------
New England as per cent of United States:							
1925	16. 3	13. 4	14. 6	14. 2	13. 6	12. 9	----------

[1] Not including Vermont.
[2] Exclusive of Connecticut, 13 establishments, and Rhode Island, 7.

The industry has been overcapitalized, has had too many plants in operation, and has been hampered by wasteful and inefficient selling methods. The market for New England wooden boxes, however, is regarded as a permanent one which, with proper business organization, is capable of being maintained on a profitable basis. While the consensus of opinion among box men is that the industry has in the last few years suffered a severe and permanent setback, yet it is believed that the box industry can be stabilized near its present level, with possible increases through the employment of improved methods of manufacture and distribution, the use of cheaper grades of lumber, and more effective advertising.

Stabilization of production and marketing is required to establish this business on a sound and profitable basis. Attempts were made as far back as 1917 to establish a closer coordination among box manufacturers. Recent far-reaching efforts by manufacturers have been made in the line of a careful analysis of the whole industry from the standpoint both of production and of marketing.

The competition resulting from overproduction, both actually and relatively, especially among the smaller manufacturers, brought about a situation where selling price was frequently below the actual cost of manufacture. The recent tendency has been toward the elimination of the smaller plants and concentration in large establishments where production can be integrated to reduce wastes and cut down operating costs and to get full value out of the materials. An example of such integration is the recent combination of a number of plants of two of the largest box-making companies in New England, whose product is claimed to comprise about one-fourth of the entire New England production.

From the angle of production the future of this industry depends upon a supply of suitable and accessible timber for box manufacture. Foresighted companies that have built up adequate timber reserves are in the most favorable position. Most of the lumber now used for box material is sawed in small lots by portable sawmills. This makes a problem for the small sawmill which must sell its product ungraded. Such material is bought and sorted by the box manufacturers, who sell the best portion as long lumber and use the rest for box material.

CHANGES IN SALES VOLUME

Information in reply to a special inquiry for this report by the Department of Commerce was received from 45 manufacturers, with aggregate sales in 1925 amounting to upward of $18,000,000, distributed by States as follows: Massachusetts, 25; New Hampshire, 9; Vermont, 4; Maine and Connecticut, 3 each; Rhode Island, 1. Two-thirds of these manufacturers had an annual volume of business ranging between $100,000 and $500,000. There were 9 smaller concerns, 6 of which had individual sales below $50,000; also 6 establishments above this range, of which 4 exceeded $1,000,000 each.

Individual increases in sales from 1921 to 1925 were shown by 21 of the companies, and decreases were shown by 18 companies. Up to 1923 increases were indicated by 25 companies and decreases by 10 companies; in 1924, however, increases were shown by only 9 companies, while 30 showed decreases; and in 1925 increases over the preceding year were shown by 13 companies, while the individual sales of 28 companies decreased. The trend of aggregate gross sales from 1922 to 1926, in the Harvard Forest survey, showed a very substantial increase in 1923, followed in 1924 by a sharp falling off to below the 1922 total, with a slight improvement in 1925 and further improvement in 1926.

The reason most often given for decreased sales is the growth in use of fiber, corrugated paper, and plywood materials as substitutes for wooden boxes. One New Hampshire manufacturer expressed the opinion that the overproduction of wooden containers, resulting from the increased use of these other materials, was at least 100 per cent. He estimated that wooden containers in 1923 comprised 49 per cent of the total used and substitute materials 50 per cent; and that in 1925 wooden containers comprised only 40 per cent, while substitutes had increased to 60 per cent.

The business of a few companies showed a continuous growth from 1921 to 1925, which was attributed in individual cases to lowered manufacturing costs and new selling methods. Several concerns indicate a change from making wooden boxes to the making of box shooks and veneered boxes from native hardwood logs. Some report a lowering of their manufacturing costs by the use of plywood in place of pine.

DISTRIBUTION

All the reporting companies indicated that the majority of their sales are made in New England, the average of New England sales being 78.3 per cent of their aggregate total. The prevailing method of distribution is direct to the consumer. According to the Harvard Forest survey, 90 per cent of the aggregate sales were made through the direct method and 10 per cent through commission men. A few manufacturers reported sales of a portion of the output to wholesale dealers, and one concern through an exclusive distributor. Most of

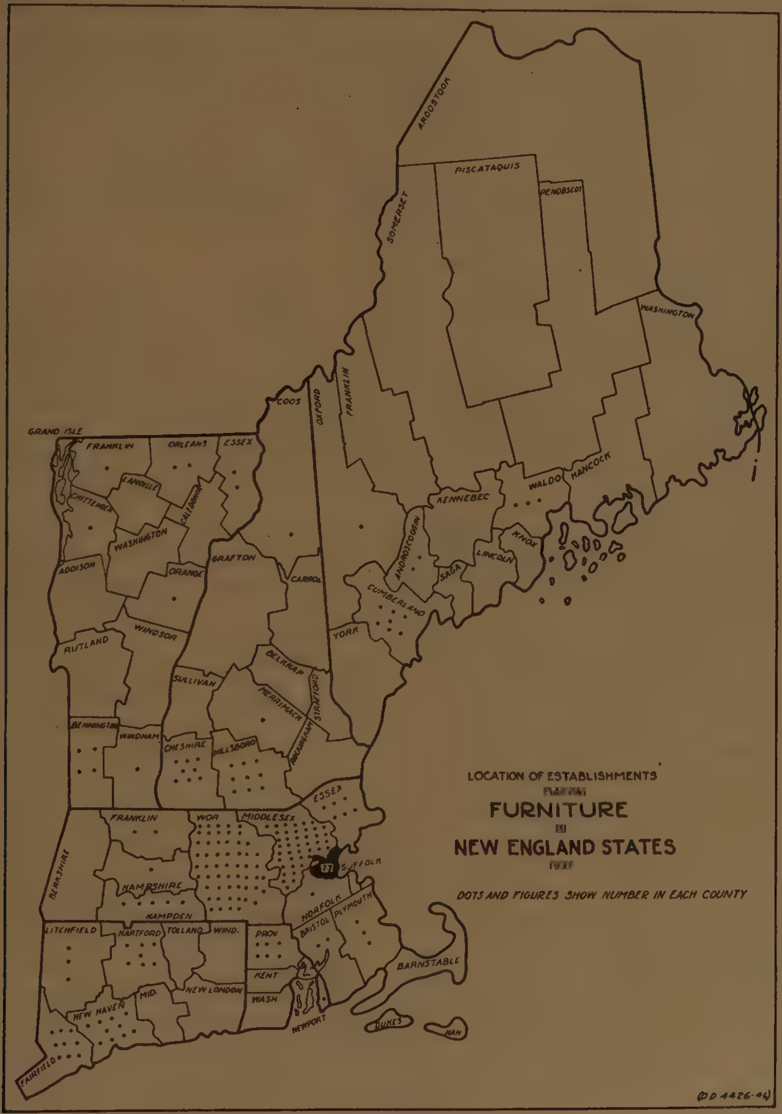
LOCATION OF ESTABLISHMENTS
MAKING
FURNITURE
IN
NEW ENGLAND STATES
1937
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CALEDONIA
CHITTENDEN
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
KENNEBEC
WALDO
HANCOCK
KNOX
LINCOLN
SAGA
ANDROSCOGGIN
CUMBERLAND
YORK
WINDSOR
RUTLAND
BELKNAP
STRAFFORD
MERRIMACK
SULLIVAN
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ROCKINGHAM
ESSEX
FRANKLIN
WOR
MIDDLESEX
77
SUFFOLK
BERKSHIRE
HAMPSHIRE
HAMPDEN
NORFOLK
PLYMOUTH
BRISTOL
BARNSTABLE
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV
KENT
WASH
NEW LONDON
MID.
NEW HAVEN
FAIRFIELD
NEWPORT
DUKES
NAN
(DD 4426-46)

Figure 45

the product sold outside New England is marketed through six or eight brokers in New York City. In most instances the advertising is through local mediums in which newspapers and trade journals are most frequent.

FURNITURE

Furniture making ranks first in importance among the wood-manufacturing industries in New England, contributing, in 1927, about 33 per cent of the total revenue for the group, adding more than $27,000,000 to the manufacturing income of the region, and providing a livelihood to more than 11,000 wage earners, who were paid nearly $15,000,000 in wages. The furniture industry provided a market for nearly $22,000,000 worth of materials, and its products had a total gross value exceeding $49,000,000. The New England output in 1925 represented 5.2 per cent of the total national value of furniture products.

Furniture manufacture in New England shows a substantial advance in the 2-year interval from 1925 to 1927, with an increase in revenue of upward of $3,000,000 and of more than $1,000,000 in annual wages, while the gross output increased in value by nearly $4,000,000. These increases, however, were confined to Massachusetts and Connecticut, which together represent approximately 80 per cent of the region's activity. The total number of New England establishments increased by 10. A slight falling off is observed in value of output in Vermont and Maine, while New Hampshire was practically unchanged. In Vermont the number of workers showed some increase. In comparison with earlier years the furniture industry in New England shows a moderate but steady growth, as is indicated by the census figures for 1914 and 1904. These totals for New England are presented in the following table, together with the data for the individual States in 1927 and 1925.

FURNITURE MANUFACTURE IN NEW ENGLAND STATES 1927 AND 1925

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Massachusetts:							
1927	194	8,077	11,027	16,682	36,796	20,114	74.1
1925	191	7,834	10,172	16,051	33,638	17,588	72.2
Connecticut:							
1927	29	872	1,307	1,787	4,466	2,679	9.9
1925	29	729	1,047	1,519	3,669	2,149	8.8
Vermont:							
1927	12	1,183	1,319	1,383	3,508	2,125	7.8
1925	11	1,074	1,186	1,323	3,627	2,304	9.5
New Hampshire:							
1927	19	688	797	1,259	2,647	1,389	5.1
1925	15	674	768	1,248	2,654	1,406	5.8
Maine:							
1927	12	268	298	474	1,040	566	2.1
1925	10	306	323	481	1,112	630	2.6
Rhode Island:							
1927	7	96	139	318	602	285	1.0
1925	7	96	142	240	511	271	1.1
Total:							
1927	273	11,184	14,887	21,902	49,060	27,157	----------
1925	263	10,713	13,638	20,862	45,210	24,348	----------
1914	222	9,626	5,360	8,007	18,730	10,723	----------
1904	210	8,748	4,280	6,681	14,451	7,770	----------
New England as per cent of United States:							
1925	8.13	5.92	6.06	2.40	5.21	5.03	----------

LOCALIZATION OF INDUSTRY

Massachusetts is the principal New England producer, its product in 1927 having a value of approximately $36,800,000 and comprising three-fourths of the New England output. Connecticut and Vermont in 1925 were of approximately equal rank, each comprising about 8 per cent of the total for that year. In 1927, however, the value of the output in Connecticut was considerably greater than that of Vermont, although Vermont employed a greater number of workers. New Hampshire contributed in 1925 about 6 per cent of the New England total. The furniture industry is of minor importance in Maine and in Rhode Island. (See fig. 45.)

The industry is localized to a considerable extent in the north central part of Massachusetts and southern New Hampshire. Gardiner has long been an outstanding center for chair manufacture. The nearby towns of Leominster and Winchendon are large producers of chairs and fiber furniture, while Keene, in New Hampshire, has important factories. The making of office furniture in Cambridge and that of upholstered furniture in Boston hold places of significance in the New England furniture industry. In a number of towns and cities in New England in the last few years there has been considerable growth in the making of upholstered furniture, the most of which goes into local consumption.

MATERIALS USED

The principal materials used in furniture manufacture are lumber and hardware. Besides these, there is a considerable market for upholstering materials, paint, glue, enamel, varnish, lacquer, veneer, leather, and cretonne. The principal woods used are birch, maple, oak, mahogany, and walnut; individual establishments also use rattan, cane, reed, and fiber. Of 90 manufacturers indicating the source of their raw materials, two-thirds stated that the greater portion of their wood is purchased from local sources within New England, while the others obtain it chiefly from outside sections. One of the largest chair manufacturers reported that supplies of birch and maple are obtained chiefly from Vermont and New Hampshire. Red gum and oak come from the South. Purchases of mahogany and other rare woods are made outside New England, or from importing houses in the Boston district.

Wood is the principal material used in New England furniture, although reed goods have been important, and in recent years considerable quantities of fiber furniture have been made. Relatively little metal furniture is manufactured in New England. Detailed figures for various types of furniture are available only for Massachusetts. Furniture for household use comprised about two-thirds of the total production of this State in 1925; suites for living room, bedroom, and dining room, 42 per cent; and chairs, benches, and stools, 33 per cent. About one-tenth of this was made of fiber, rattan, reed, and metal, and the rest of wood. After household furniture come products for office or institutional use, comprising one-fourth of the total. The chief items in this class are cabinets, desks, and chairs. The making of baby carriages, cribs, and similar articles is also important. Most of the baby carriages for the whole country are made in New England.

One difficulty found in the use of New England lumber as furniture material arises from the fact that it is sawed in too small quantities to afford the selection of different grades in the volume desired by the manufacturer. Hence, he must buy such materials according to log run, which involves loss and waste from inferior material, although this loss is offset by the lower price paid for log-run stock. It is the opinion of men in this industry that local supplies of timber are adequate for present and for future needs. There are abundant hardwood stocks in Maine which can be used for this purpose.

In the last few years the use of fiber made from wood pulp has had an extensive development in furniture manufacture, largely supplanting the cane and reed furniture. Some of this fiber is now made under special patents in New England and some comes from the Middle West. Before the war, which temporarily put an end to the importation of reed and cane, considerable quantities of these materials were used in New England for making furniture, being purchased from German concerns which imported the cane from China and split it for use. At present fiber is used almost entirely in place of reed and cane. New England concerns using this material generally make their purchases of wood for frames from local sources.

NEW ENGLAND AS A FURNITURE MARKET

The importance of New England as a market for furniture is indicated by comparison of shipments of new furniture into these States with the corresponding outward shipments. In 1924 the tonnage of new furniture shipped into New England was twice that of the furniture shipments from New England to other parts of the country, thus indicating that the section is dependent upon outside sources to the West and South for a large portion of its furniture requirements. Yet a substantial part of the market for furniture made by New England manufacturers lies outside that region. According to reports from 64 New England companies whose aggregate sales in 1925 were approximately $15,000,000, the portion of their sales made within New England averaged 42 per cent of their total business. Most of these replies indicated that New England sales had been on the increase in recent years.

The proportion sold within New England by these companies varied materially with the type of furniture. In the upholstered type, which was highest, the average for 10 companies was 77 per cent; for 10 makers of reed and fiber furniture and 4 concerns making colonial types, New England sales were 64 and 63 per cent, respectively; while New England sales of living-room and bedroom furniture by 4 companies averaged 58 per cent of their total business. In contrast to these types, the average of New England sales for 17 chair manufacturers was only 26 per cent, and for 6 makers of office and school furniture 25 per cent of their total 1925 business. A summary of New England sales by manufacturers of different types is given in the following table.

SALES IN NEW ENGLAND BY 64 MANUFACTURERS OF FURNITURE IN 1925

Kind of furniture	Firms	Total sales in 1925	Average percentage sold in New England
Upholstered	10	$2, 283, 000	77
Reed and fiber	10	1, 135, 000	64
Colonial	4	959, 000	63
Living-room and bedroom	4	974, 000	58
Tables, cabinets, etc	2	171, 000	46
Special and custom-made	5	866, 000	39
Chairs	17	5, 349, 000	26
Commercial and school	6	1, 952, 000	25
Other	6	1, 256, 000	30
All types	64	14, 945, 000	42

CONDITIONS IN THE FURNITURE INDUSTRY

Size and age of establishments.—Some 90 furniture manufacturers supplied information to the Department of Commerce regarding conditions in the industry. Of these, 81 submitted sales figures aggregating for 1925 nearly $18,000,000, thus representing approximately 40 per cent of the whole industry in New England. These represented the different producing States—63 reporting from Massachusetts, 7 each from Vermont and Connecticut, 3 from New Hampshire, and 1 from Maine.

Most of the establishments were of small or medium size. There were 38 companies with individual sales of less than $100,000, including 19 plants below $50,000; 34 companies between $100,000 and $500,000; and 9 companies between $500,000 and $2,000,000. The average for the group was $234,000 per establishment. Branch plants were indicated in only a few cases and these were within New England, most of the manufacturers operating on a scale that does not warrant branch expansion.

Approximately a quarter of the companies had started business within the preceding six years, and changes of management in that period were reported by nearly as many. The average period of operation for all reporting was 27 years. Sixteen companies had been in continuous operation for 50 years or more, and two of these for more than a century.

Individual increases in plant capacity since 1921, ranging from 10 to 100 per cent, were indicated by one-fourth of the reporting companies; and several, principally makers of upholstered furniture, reported a doubling or tripling of capacity. A maker of folding chairs had trebled his capacity, and a maker of fiber furniture reported even a greater increase. Operations in proportion to maximum capacity in 1925 ranged, in individual cases, from 60 to 90 per cent, with a weighted average for the group of 71 per cent. In numerous instances manufacturers have added fiber products akin to furniture, and these concerns generally showed a high degree of activity. A large concern making baby carriages and porch furniture, which has had a very substantial growth in the last few years, reported operating at 90 per cent of maximum capacity.

Operating activity.—Employment figures show fairly regular activity throughout the year, with a slight slacking in employment in the summer months, indicating that seasonal periods of operations have been overcome to a large degree. This is the result, in part, of definite efforts by manufacturers. The variation in employment for the New England furniture industry as a whole, in terms of contrast between the highest month, November, and the lowest month, July, in 1925, was 14.4 per cent of the yearly average number of workers employed. Provision of wage incentives was indicated by approximately one-half the reporting companies; in most cases the proportion of workers paid on a piecework basis was small, usually from 5 to 15 per cent. The improvements effected in factory operation are principally in the prevention of accidents, the standardization of product and materials, and the control of production.

Sales trends.—The sales trends for 73 companies show a general increase in 1925 compared with 1921, and an average increase since 1923 of 10 per cent. There were no pronounced differences according to the size of business, although the greatest proportional number of increases was shown by the larger companies whose individual sales exceeded $300,000. There was pronounced contrast, however, in the different types of furniture. The aggregate sales of 18 chair manufacturers showed a slight decrease from 1923 to 1925—less than 1 per cent. Sales of 11 manufacturers of upholstered furniture and of 6 makers of special and custom-made furniture increased by about 30 per cent; and those of 4 concerns making colonial furniture increased 24 per cent.

Distribution methods.—Of the methods of distribution indicated by 78 concerns, about one-half of them place their sole dependence upon one type of outlet, while one-half use more than one. Of 40 companies using a single outlet, 21 reported sales direct to retailers, while 14 reported selling to wholesalers, 4 through selling agents, and 1 direct to the consumer. The most frequent combination of outlets was that of wholesale and retail dealers. Two concerns reported sales through exclusive distributors, and one marketed its product through its own store. The use of trade-marks was indicated in the majority of cases. Regional or local advertising, in which the trade journal and direct mail are of equal importance as mediums, was indicated by about one-half the companies reporting. The average expenditure for advertising by these was approximately 2 per cent of their sales, and the average cost of selling, aside from advertising, was 10 per cent.

Prospects as viewed by members of the industry.—Interviews with prominent manufacturers of furniture in New England brought out conflicting points of view about the prospects for this industry. The president of a large company expressed his faith in specialized production of colonial styles, Windsor chairs and other articles, in which emphasis is placed on workmanship and quality. In his opinion New England manufacturers have an open market on the Pacific coast, where water transport and through-car rates make this an accessible field. He holds that New England can meet other competition on office chairs in the eastern market as far south as the Potomac.

The following quotation from a maker of special furniture throws light upon the situation, as seen by some of the furniture manufacturers:

> One of the hardest features in this business is the greater variety of styles and the demand for special finishes, which makes it difficult to put out large quantities of one design, whereby we could keep down production costs and prices. In spite of this we do make fairly large cuttings of the greater number of patterns and then gamble on our ability to sell them afterwards. Manufacturers as a whole are to blame for this situation because productive facilities were expanded so much during the war that competition was increased, and a great many factories resorted to the "new pattern" method of meeting competition. Standardization would help to lower costs and at the same time increase profits, but it would be very difficult to set up any standards of patterns and styles in this industry. It requires very little machinery for beginners to make a start in a business of this nature, and these would upset any standardizing that might be arranged among well-equipped factories. The smaller competitors do more harm in the way of creating competition among the trade before they learn their costs than they do in the way of actual deliveries of competing merchandise.

A large manufacturer of special fiber products, whose business has shown a continuous increase, describes the company's attitude and sales organization thus:

> We sell both to the jobber and the retail dealer, most of our product going to five or six important jobbers, who take large quantities of goods. They have their own salesmen calling upon the trade; we also have a number of salesmen that represent us directly on a salary and commission basis. We have paid more attention to studying our product than to the principles or methods of marketing. By improving the product and devising ways and means of manufacturing at a lower cost, and making sure that the goods are well made and will give satisfaction, we have established a reputation which, together with a price that will meet competition, has insured steady progress.
>
> We are now in our new factory with new and up-to-date equipment, which we feel is essential to the satisfactory advancement and progress of the business. To the best of our knowledge the attitude of our industry in New England is generally the same.

WOOD TURNING AND WOODENWARE

The manufacture of turned and carved articles from wood and of various other products that are designated in the trade as woodenware forms an important New England industry. It depends for its principal raw materials upon native supplies of hardwood—birch, maple, and beech—and, to some extent, upon supplies of pine and spruce. It is thus a distinctly native industry which provides a considerable market for New England forest products and also furnishes a manufacturing revenue to the region of some $10,000,000.

LEADING PRODUCTS

The industry includes two fairly distinct groups of products. The first consists largely of turned articles—such as spools, bobbins and shuttles, small handles, dowels, shoe pegs, tubs, and kits—consumed in the industrial market afforded by other manufacturing activities. In addition to these the making of wooden shoe lasts as an accessory of shoe manufacturing assumes considerable importance, the value of products in Massachusetts alone exceeding $3,000.000 in 1927. The second group, which includes mainly the articles known in the trade as woodenware, embraces such products as clothespins, toothpicks, wooden dishes, trays, bowls, rolling pins, skewers, and washbowls. These products are largely articles for direct consumption in a nation-wide market.

In the production of turned and carved wood articles, the State of Maine holds first place in the national production. This industry is of considerable importance in each State of northern New England

and in Massachusetts. Outside New England the principal States in wood turning are Michigan, Tennessee, Pennsylvania, Ohio, and Illinois, in the order given. In the production of items designated here as woodenware, Maine, which leads in New England, is surpassed by New York State and by Michigan.

Many of these woodworking plants were started by native New Englanders, who set up their mills in a small way to work up local supplies of timber on family timber holdings. Thus the location of plants has been determined mainly by local supplies of raw materials. The location of spool, toothpick, and shoe-peg factories, in particular, was determined by the local supplies of birch. There are adequate supplies of raw materials for maintaining these industries in the regions where they are now located. Indeed, New England, particularly Maine, has an abundant supply of hardwoods adapted to the making of these products.

IMPORTANCE IN INDIVIDUAL STATES

The importance of the turned-wood industry and of woodenware in 1927 and 1925 is shown in the following table, with comparative figures for 1914 and 1904, and in a separate table figures for lasts and related products are given. Together there were in these groups in 1925, 288 establishments, which gave employment to some 5,300 workers, had a total value of product approaching $17,500,000, and contributed to the manufacturing revenue of New England not far from $10,000,000 in value added by manufacture. The manufacture of lasts showed material reduction in 1927, but there was substantial increase in the other manufactures of wooden goods, particularly in Maine and Vermont.

Turned Wooden Goods and Woodenware in New England States, 1927 and 1925

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Maine:							
1927	64	1,896	1,730	2,677	6,325	3,648	41.4
1925	70	2,139	1,857	3,012	6,178	3,166	44.7
Massachusetts:							
1927	48	1,068	1,174	1,510	3,547	2,037	23.1
1925	49	1,076	1,119	1,716	3,722	2,006	28.3
Vermont:							
1927	47	929	819	1,168	2,870	1,702	19.3
1925	33	613	524	739	1,706	967	13.6
New Hampshire:							
1927	26	308	310	361	994	633	7.2
1925	22	376	353	414	1,007	593	8.4
Connecticut:							
1927	17	168	178	254	638	385	4.3
1925	17	173	188	252	609	357	5.0
Rhode Island:							
1927	6	279	273	281	696	415	4.7
Total:							
1927	208	4,643	4,484	6,249	15,070	8,821	
1925 [1]	191	4,377	4,041	6,133	13,222	7,089	
1914 [2]	273	5,443	2,580	3,499	7,695	4,196	
1904 [3]	301	4,988	1,912	2,209	5,547	3,338	
New England as per cent of United States:							
1925 [1]	26.49	29.28	27.19	24.89	23.73	22.80	

[1] Not including 5 wood-turning establishments in Rhode Island.
[2] Not including 1 wood-turning establishment in Rhode Island.
[3] Not including 1 wood-turning establishment in Connecticut.

MANUFACTURE OF LASTS IN NEW ENGLAND STATES, 1927 AND 1925

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Massachusetts:							
1927	29	782	1,072	1,006	3,174	2,168	100.0
1925	31	894	1,281	1,339	4,076	2,737	91.0
Maine and New Hampshire:							
1925	3	85	106	92	362	270	9.0
Total:							
1925	34	979	1,387	1,431	4,438	3,007	----------
1914 [1]	32	890	653	591	1,908	1,317	----------
1904 [2]	23	501	396	381	1,207	826	----------
New England as per cent of United States:							
1925	54.84	48.11	46.05	46.93	47.72	48.10	----------

[1] Not including Maine, 2 establishments; New Hampshire, 1.
[2] Not including Maine, 1 establishment; New Hampshire, 1; and Rhode Island, 1.

FACTORS AFFECTING THE INDUSTRY

The wood-turning and woodenware industries consist prevailingly of small manufacturing plants, many of which have limited capital and inadequate organization for marketing their product. There are, however, some individual establishments of substantial size that are well organized. The woodenware industry, which was formerly largely concentrated in the New England States, is now active in other parts of the country, especially in Michigan, Tennessee, Pennsylvania, and Ohio. The largest clothespin factory now operating in the United States is said to be in West Virginia.

In the past few years there has been excessive producing capacity in this industry, partly the result of overexpansion in the war years, particularly by small establishments which incurred considerable outlays for plant and equipment. In the face of this there has been a pronounced decline in consumption, brought about by the development of rival products. A generation ago the manufacture of galvanized-iron pails, tubs, and other articles formerly made of wood was a great blow to the woodenware industry, and more recently the increasing use of pulp for making such articles has greatly limited its field of consumption.

The industry has been disturbed by the frequent tendency of owners of timber to go into the manufacture of woodenware without first assuring themselves of a market for their product. The consequence has been excessive price competition, which has sometimes forced the market below the cost of production. Manufacturers producing in too small a quantity to bid for a national market have been faced with the necessity of accepting terms offered by jobbers who do not have enough stake in the individual transaction to justify intensive salesmanship.

Only the most efficient companies which have direct access to distribution channels have been able to prosper under the competitive conditions of recent years. In the opinion of leading manufacturers the only remedy for small producers appears to be concentration of activity in organizations large enough to justify a national marketing program. The principal marketing outlet for woodenware at the present time is through the large grocery wholesalers and the chain-store organizations, which provide only a limited market.

EXPERIENCES OF MANUFACTURERS

Number, size, and age of plants.—Of the 191 makers of turned articles and woodenware in New England in 1925, special information regarding their production and marketing activities was received from 126 concerns, thus representing a major portion of these industries. The greater proportion of these consisted of small establishments, although a few reporting were of substantial size. The average period of operation was 25 years, and the average period under present management was 16 years. Changes in management within the last six years were relatively infrequent, being reported by 15 concerns. Branch plants were reported by 11 companies, all located within New England near local sources of timber.

Plant activity.—The degree of plant activity in 1925, as shown by a weighted average of all reporting establishments, was approximately 70 per cent of their full capacity. There was a good deal of variation among individual plants in this respect, a number reporting operations at full or nearly full capacity, while many were operating at only a small fraction of their possible output. Increases in capacity since 1921 were reported by one-fifth of the group, usually moderate in extent.

The employment at different seasons of the year was found to be generally quite uniform, largely as the result of the making of supplementary products or the manufacture for stock in otherwise slack periods.

Manufacturing practice.—Payment of employees on a piecework basis has had little development in the industry, as only one-fourth of the companies reported any piecework, and the average proportion of employees so paid by these companies was only 18 per cent of their total pay-roll. There were several concerns, however, which reported up to 100 per cent of their workers paid on such an incentive basis. The difficulty in establishing equitable standards for piecework and the impracticability of such incentive plans under some conditions doubtless account for this low figure. Yet in this industry, where labor costs comprise an average of 35 per cent of the value of the product, the use of any methods which have a tendency to reduce such costs is important.

Improvements in manufacturing practice were indicated in various instances, of which the following are the most significant: Reduction of number of items in lines resulting in simplification of production problems; standardization of equipment through use of automatic machines; increased production and sales made possible by lowered costs resulting from rearrangement of machinery; uniform cost accounting which enables manufacturers to know the exact status of costs every four weeks, thus making it possible to govern sales policies and manufacturing and production schedules accordingly.

Marketing practices.—Of the total sales of these 126 companies, upward of one-half was stated to be made within New England, the unweighted average being 53 per cent of the total sales. There was some variation in the different States, the percentages being considerably higher in Massachusetts and Rhode Island and lower in Maine. By one-third of the companies reporting the trend of total sales in the last three years was said to have increased, while one-fourth stated that sales had decreased, and the rest reported that their sales were unchanged. Sales in the New England market were said to be moving upward in the same number of instances as in those indicating a downward trend.

Individual increases in volume of business are attributed principally to the marketing of new products and to the extension of sales territory, while the principal reasons given for decreased volume are competition from other sections, together with general overproduction. For example, the market for spools has been much curtailed in recent years by the reduced demand for thread for domestic consumption.

Channels of distribution.—These companies reported that distribution is made principally through wholesale houses or direct to the manufacturing consumer. The greater part of goods designated as woodenware, which are articles for final consumption, are marketed through the wholesale dealers and chain-store organizations; while a great deal of the turned-wood product is used by other manufacturers who make their purchases direct. The use of trade-marks does not appear to be at all prevalent in these lines, only one-fourth of the total number of concerns indicating any such practice. The use of national advertising mediums in the form of direct mail or trade journals was indicated in 23 replies. A greater number indicated local advertising, chiefly through newspapers. The average cost of advertising of the companies which gave figures was 1.6 per cent of their total sales.

A leading manufacturer of woodenware, with an annual business approaching a half million dollars in the manufacture of wooden pails, tubs, and washboards, reports that he has warehouses and local representatives in several large distributing centers of the United States. Most of the product is made and shipped on advance orders, and, wherever possible, shipments are made in carload lots to the warehouses. Some of the other large manufacturers in this line follow a similar plan, but most of them are said to have their own representatives who call directly on the trade. By this practice they avoid price-cutting competition among manufacturers, such as would result from throwing their product on the open market.

Changes in demand.—The growth of package candy sales is said to have cut down materially the market for candy pails. New England candy manufacturers use from 50 to 60 carloads of pails a year, amounting to from 18,000 to 20,000 dozen. These are said to be bought entirely from New England manufacturers. Formerly there was a large market for lard tubs, but this has been supplanted to a great extent by the use of old butter tubs, which has thus taken this market from New England manufacturers. The use of wooden fish pails and pickle kits is considered likely to continue, because other materials are affected by brine and acid. Some competition in the market for tubs and pails is afforded by manufacturers on the Pacific coast. There is also near-by competition from New York

State, where one of the largest woodenware manufacturing concerns is located.

The export trade is said to be of little importance among woodenware manufacturers. One company which recently attempted to develop a foreign market in Great Britain reports that it met with no success. The executive of one of the largest producers of toothpicks, clothespins, and other woodenware, reports, however, that export sales comprise about 10 per cent of the company's total business.

Raw materials.—Most of the New England manufacturers of woodenware are said to buy their supplies of wood locally, generally within a 20-mile radius of the manufacturing plant. One of the leading New England manufacturers obtains most of his material within hauling distance, but a small portion comes by rail, the maximum haul being about 60 miles. This company buys standing timber and cuts the trees, purchasing the land where possible and reforesting it with Norway pine, because of its resistance to the pine-tree blister rust. The natural growth and new planting of such timber, as practiced in recent years, are considered sufficient to keep up the New England supply for the requirements of manufacturers of woodenware.

STONE AND OTHER MINERAL MANUFACTURES

Although the stone industries of New England are overshadowed by other major lines of manufacture in value of output and in number of persons engaged, yet these mineral activities are of outstanding importance to a number of producing sections.[1] The raw materials constitute one of the native resources of the region and the products are sold largely outside New England, bringing in a substantial income from other parts of the country. About two-thirds of the gross value of these products represents an income from the manufacturing processes, apart from the cost of materials. A large portion of the money spent in the purchase of materials likewise represents a local source of revenue. Since these industries, in large measure, are carried on independently of other lines of New England manufacture, their market is not greatly affected by general industrial conditions.

PRINCIPAL PRODUCTS

This group of manufactures includes, in addition to the products of stone quarries, which are the principal items, brick, tile, and other clay or refractory products, as well as lime and articles made of concrete. The products of this group had an aggregate value in 1927 exceeding $57,000,000 and contributed $38,366,000 to the manufacturing revenue of New England, as shown by value added by the manufacturing processes above the cost of materials. These industries gave employment to an aggregate of 14,116 wage earners and paid more than $22,000,000 in wages. Materials used in manufacture, including fuel, power, and supplies, provided an aggregate market exceeding $19,000,000. The importance of the manufactures in this group for New England as a whole is shown for 1927 and 1925 in the following summary table.

Stone and Earth Industries in New England, 1925 and 1927

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Granite, marble, slate, and stone work:						
1927	487	9,597	15,878	13,131	40,178	27,047
1925	512	8,228	13,399	12,580	36,860	24,280
Clay products and refractories: [a]						
1927	86	2,256	2,995	1,895	6,915	5,020
1925	81	2,277	3,127	1,789	6,570	4,781

[a] Exclusive of 4 establishments.

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[1] For location of principal producing sections see first part of this report under heading, "Mineral Resources."

STONE AND EARTH INDUSTRIES IN NEW ENGLAND, 1925 AND 1927—Contd.

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Concrete products:						
1927	121	1,333	2,195	1,880	5,945	4,065
1925	79	1,230	2,000	1,276	4,971	3,695
Lime [b]:						
1927	23	930	1,268	2,103	4,338	2,235
1925	30	1,481	1,411	2,972	6,742	3,771
Total [c]:						
1927	717	14,116	22,335	19,010	57,376	38,366
1925	702	13,216	19,937	18,617	55,143	36,527

[b] Exclusive of 1 establishment.
[c] Exclusive of 5 establishments.

GRANITE, MARBLE, AND OTHER STONE

Manufactures of granite, marble, slate, and other stone are of outstanding importance, representing 70 per cent of the total for the group, both in value of product and in manufacturing income. The manufacture of clay products and refractories represents about 12 per cent, and that of lime slightly less than 8 per cent. Concrete products comprised about 10 per cent of the total. No segregated figures are available from the Bureau of the Census for the individual kinds of stone. According to data from the Bureau of Mines, New England contributes approximately 45 per cent of the total value of granite for the United States, 38.4 per cent of the marble, 36.3 per cent of the slate, and 20.7 per cent of the crushed stone and trap rock. The combined importance of granite, marble, slate, and other stone in 1927 and 1925 is shown for each State in the accompanying table, together with the national position of New England in 1914 and 1904.

In the 2-year interval following 1925 the value of output from the stone industries in all New England increased by more than $3,300,000, with a gross value of product in 1927 exceeding $40,000,000. There was an increase in employment of more than 1,300 men, and their annual earnings in 1927 were almost $2,500,000 greater than in 1925. Each State shared in the increased activity of the stone industries, although there was a reduction in number of operating plants in each State except New Hampshire, and some falling off in value of output and of net revenue in Rhode Island.

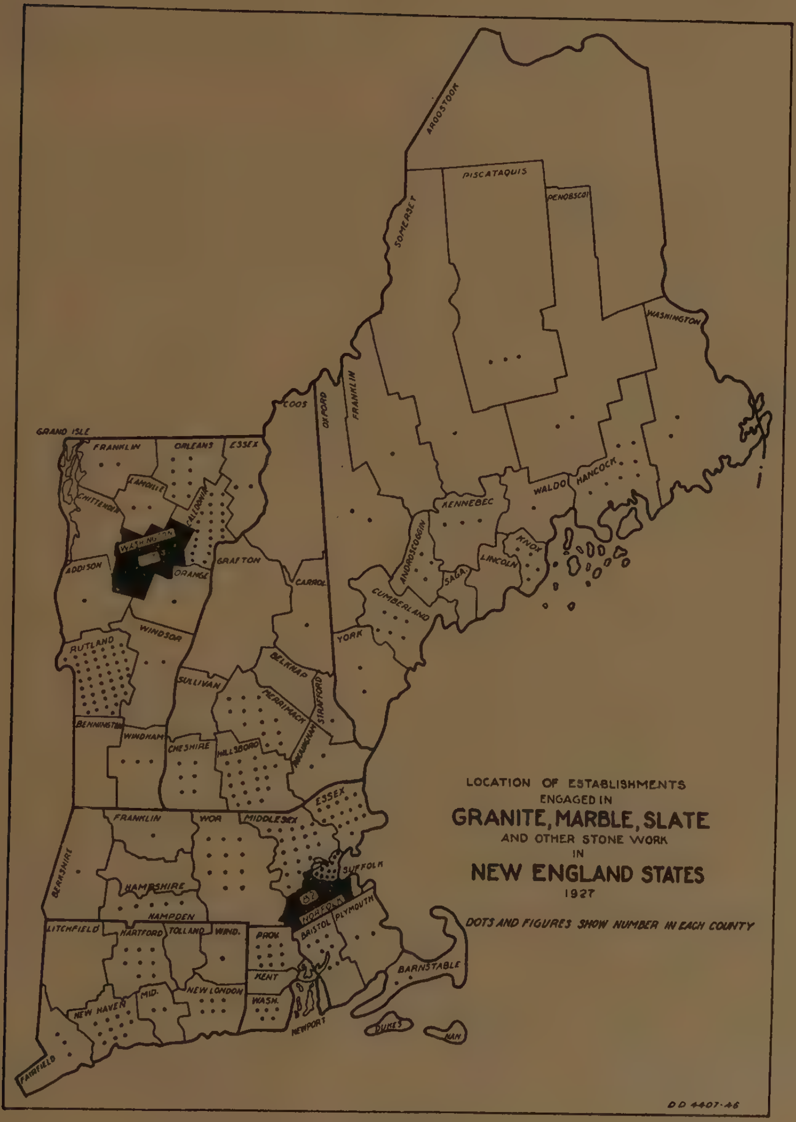
LOCATION OF ESTABLISHMENTS
ENGAGED IN
GRANITE, MARBLE, SLATE
AND OTHER STONE WORK
IN
NEW ENGLAND STATES
1927
DOTS AND FIGURES SHOW NUMBER IN EACH COUNTY
AROOSTOOK
PISCATAQUIS
PENOBSCOT
SOMERSET
WASHINGTON
FRANKLIN
OXFORD
COOS
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
KENNEBEC
WALDO
HANCOCK
ANDROSCOGGIN
KNOX
LINCOLN
SAGA.
CUMBERLAND
YORK
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
ROCKINGHAM
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ESSEX
FRANKLIN
WOR
MIDDLESEX
BERKSHIRE
HAMPSHIRE
SUFFOLK
82
NORFOLK
PLYMOUTH
HAMPDEN
LITCHFIELD
HARTFORD
TOLLAND
WIND.
PROV.
BRISTOL
BARNSTABLE
KENT
MID.
NEW LONDON
WASH.
NEW HAVEN
NEWPORT
DUKES
NAN
FAIRFIELD
DD 4407-46

Figure 46

MANUFACTURE OF GRANITE, MARBLE, SLATE, AND OTHER STONE IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars				Per cent of New England total value added
			Wages	Cost of materials	Value of products	Value added by manufacture	
Vermont:							
1927	203	5,205	8,411	7,870	21,318	13,448	49.7
1925	211	4,651	7,087	6,480	18,397	11,917	49.0
Massachusetts:							
1927	157	2,166	3,820	3,208	10,834	7,625	28.2
1925	165	1,611	3,375	3,592	10,393	6,801	28.0
Maine:							
1927	40	924	1,319	520	2,697	2,177	8.0
1925	44	653	992	844	2,659	1,815	7.5
New Hampshire:							
1927	42	609	1,046	546	2,147	1,600	5.9
1925	33	512	847	449	1,932	1,483	6.1
Connecticut:							
1927	31	343	671	549	1,794	1,245	4.6
1925	41	308	593	754	1,901	1,147	4.9
Rhode Island:							
1927	14	350	611	437	1,389	952	3.6
1925	18	293	505	461	1,578	1,117	4.6
Total:							
1927	487	9,597	15,878	13,131	40,178	27,047	----------
1925 [1]	512	8,228	13,399	12,580	36,860	24,280	----------
1914 [2]	930	17,081	11,962	7,190	25,684	18,494	----------
1904 [2]	664	19,106	11,182	5,114	23,552	18,438	----------
New England as per cent of United States:							
1925	21.7	22.5	25.5	18.8	19.1	19.3	----------
1914	19.0	31.1	31.5	19.0	24.0	26.7	----------
1904	25.5	37.4	35.1	19.3	27.8	31.7	----------

[1] Includes only establishments with product of $5,000 or above.
[2] Includes all establishments with output of $500 or more.

In this group of stone products Vermont stands out as the leading State of New England, contributing more than half the total value of product and nearly 50 per cent of the net regional revenue from this source. The stone industry is the most important one in Vermont, contributing nearly one-fifth of the State's total revenue from all manufacturing. With an output from this source in 1927 exceeding $21,000,000 in value, the stone industries in Vermont produce nearly twice as much as in Massachusetts, the State next in importance in this group of industries. The four other States do not differ so widely. Maine produced about $2,700,000, New Hampshire upward of $2,100,000, and Connecticut about $1,800,000; while the Rhode Island output had a value approaching $1,400,000.

The stone industries of the United States show a pronounced falling off in activity since 1914, as indicated by the number of wage earners employed. For the country as a whole the number of wage earners in 1925 was only 52 per cent of the number in 1914, and in New England it was only 48 per cent. This reduction results partly from the increased use of labor-saving machinery; but it is to be attributed very largely to drastic changes in the use of stone products throughout the country—in particular, to the great increase in the use of concrete as building material and to the reduction in the use of monumental and paving stone.

In 11 years, from 1914 to 1925, the gross value of products of all the stone industries of New England advanced from $25,684,000 to

$36,860,000, an increase of 44 per cent; but the industrial revenue, as shown in the value added by manufacture, increased by only 31 per cent, from $18,494,000 to $24,280,000. The number of wage earners fell off more than one-half in the 11-year interval, while the total wages paid in the New England stone industries increased by 12 per cent. The national position of the New England stone industry as a whole is shown in the table on page 518.

GRANITE

Granite holds first place in the commercial stone production of New England; the granite produced in these States in 1925 represented 45 per cent of the national output. New England contributed in that year 54 per cent of the monumental granite of the whole country, 48 per cent of the building granite, about 75 per cent of the granite paving blocks, approximately 20 per cent of the production of rubble and riprap, and 14 per cent of the crushed granite for concrete and roadbed material.

Granite is produced in all six of the New England States, the order of importance in 1925 being Massachusetts, Vermont, Maine, New Hampshire, Rhode Island, and Connecticut. In that year granite represented in Massachusetts 63 per cent of the State's total output of stone products; in Vermont, 29 per cent; in Maine, 80 per cent; in New Hampshire, over 90 per cent; in Rhode Island, 80 per cent; and in Connecticut, 29 per cent of all reported stone manufactures.

Most of the granite shipped out of New England is in the finished form of monuments, columns, and building blocks, but a considerable quantity of rough granite and paving blocks is shipped to port cities along the Atlantic seaboard. The manufacture of granite paving blocks is, in a sense, a joint activity with the production of building and monumental stone, while crushed stone and riprap are their by-products. Many of the quarries sell all these products, but some of them, particularly those along the coast, produce only paving blocks for sale. In former times these New England quarries sold large quantities of paving blocks for use in the streets of Philadelphia and New York. This branch of the industry has been in large measure superseded in recent years by production of other forms of construction material.

In the granite industry there is a considerable overlapping between the quarrying of the rough stone and the carving of it into finished monuments or into building stone or paving blocks. Secondary products from the making of these articles are marketed as trap rock or crushed stone for uses as ballasting material or in making concrete. The rougher products of stone manufacture are made in or adjacent to the quarries, while much of the cutting and finishing of monuments is done by separate concerns apart from the quarrying.

EXPERIENCES OF GRANITE MANUFACTURERS

Replies to a special inquiry were received from nearly 100 New England producers and manufacturers of granite, whose aggregate business in 1925 amounted to some $14,000,000.

Type of production.—The greater portion of those replying stated that they made monuments and memorials. A considerable number sold their product as rough granite, and a few stated that building granite was their chief product. The summary for 91 replies regarding the principal product was as follows: Monuments and memorials, 69 firms; rough granite, 15 concerns; building granite, 5; paving blocks and curbing, 2. Sixteen of these companies reported as supplementary products the sale of crushed stone and riprap, paving stone and curbing, building stone, rough-granite columns, monuments, urns and vases, and granite rolls for paper-making machinery or for grindstones.

Number employed.—The general size of operations of these reporting granite manufacturers is indicated by the figures of individual employment and sales. The aggregate number of men employed by 90 companies was approximately 3,700, making an average of 41 workmen per plant. Two-thirds of the concerns employed fewer than 25 workmen each, and 17 of these employed fewer than 10 men each. There were 13 companies reporting a pay roll between 25 and 50 men each; 9 concerns between 50 and 100; 8 between 100 and 250; and 2 companies with individual pay rolls exceeding 250.

Volume of business.—As shown by 86 companies whose aggregate sales were $13,582,000, there were 52 establishments with individual sales in 1925 of less than $100,000 each. In this group, comprising chiefly small-sized operators, 23 establishments did an individual business of less than $50,000, and there were 29 operators with sales between $50,000 and $100,000. An annual volume of sales between $100,000 and $250,000 was reported by 19 concerns; 7 concerns reported sales between $250,000 and $500,000; 7 others between $500,000 and $1,000,000; and 1 reported a business exceeding $1,000,000. The average of sales for these 86 concerns was $158,000.

Age of business.—One-half of the reporting companies had established their present business within the preceding 25 years and one-sixth within 10 years. There were 38 concerns that had been in operation between 25 and 50 years, and 7 others more than a half century. Changes of management within the preceding 10 years were reported by 16 establishments. Branch establishments were indicated by 9 concerns, located principally within New England, but 2 concerns reported branches in New York State. Most of the branches were indicated to be secondary quarries for supplying rough stock for manufacture.

Materials purchased.—The principal materials purchased in this work were reported to be tool steel, shot, chilled iron, abrasives, polishing wheels, and carborundum. Other materials reported were blasting powder, acids, sand, plaster, and lumber. The majority of the companies indicated the use of practically all these materials, and in nearly all cases materials were said to be purchased within New England. In some cases purchases were made in the Middle Atlantic States or in the Middle West. Individual importations of granite were reported from Finland and of plaster from Europe.

Operating activity.—The degree of activity, as indicated by the percentage of maximum operating capacity, from reports of 74 operators whose aggregate sales exceeded $11,000,000, averaged 58.2 per cent of the maximum 1925 capacity. There were 31 establishments reporting operations at 75 per cent or more, 32 others between 50 and 75 per cent, and 11 others below 50 per cent. Additions to plant capacity were indicated in 15 cases, including 7 of the larger companies whose individual business exceeded $250,000, and 8 other concerns below that amount. Two companies stated that they had more than doubled their capacity, and 2 others had nearly doubled, while 9 operators had increased capacity more than one-fourth. Reductions were reported in three instances, amounting to 25, 35, and 50 per cent, respectively. The rest of the companies either reported no change or did not answer.

Wage incentives.—The use of wage incentives does not prevail to any considerable degree among the companies reporting. Eight of the operators stated that they used some form of incentive method in paying their workmen, 1 of these paying 90 per cent of its working force in this way, 2 others 25 per cent, and 5 others less than 10 per cent of their pay roll. Forty-six operators stated that they used no incentive method whatever; the rest did not reply to this question.

Sales trends.—Analysis of the sales trends of 76 concerns whose aggregate business in 1925 was $12,500,000 shows an increase of 49 per cent over the volume of these same concerns in 1921. Most of this increase took place previous to 1924. There was a slight decrease—less than 1 per cent—from 1924 to 1925. In terms of the experience of individual companies, the analysis shows that more than three-fourths of the establishments increased their total sales from 1921 to 1925, while one-fifth decreased and a few showed no change. All but 1 of the 15 large concerns (exceeding $250,000) had a greater sales volume in 1925 than in 1921; of 61 of the smaller companies (below $250,000), 44 showed increased sales in 1925, while 15 showed a falling off and 2 remained unchanged. For this 5-year period the sales increases were relatively more numerous among the larger companies. In the 2-year interval from 1923 to 1925, 6 of the 15 larger companies increased their sales while 9 showed decreases; and of 61 smaller concerns the number showing increased sales was approximately the same as that showing decreases. Thus, in the later period the decreases were relatively more numerous among the larger companies.

Location of markets.—Sixty-nine companies stated that a portion of their product was marketed within New England, while 10 others stated that none of their market was in that section. Five of the concerns stated that they sold all their product within New England; 17 others reported half or more of their sales in that section; and 47 others reported less than half of their sales in those States, 25 of these selling less than 10 per cent in that area. The weighted average of New England sales for the whole group, whose aggregated volume of business was in excess of $11,000,000, was 26 per cent.

Exports were reported by only 3 of the 95 reporting companies, and their combined export sales were less than 1 per cent of their total business.

An increasing volume of sales to New England customers was reported by 20 concerns, while 27 others reported decreased business in this section and 28 concerns reported no change in their New England business. Individual reasons given for increasing New England sales were increased building activity, improved labor conditions, lower prices and better products, more intensive sales effort in New England, increased advertising and sales effort, and broader acquaintance in the trade. One concern stated that its business had been increased by the use of imported foreign stone. Decreases were attributed, in individual cases, to competition from the South and the Middle West, the use of Indiana limestone in place of granite in building operations, importations of foreign stonework, increased cost of granite because of high wages, high freight rates, frequent strikes which compel builders to turn to other building materials, and keen competition resulting from overproduction within New England.

Methods of marketing.—The principal method of marketing the product, according to these companies, is direct to the retailer. Forty-seven companies reported reliance upon this channel and 35 of these reported no other channel. Thirteen concerns stated that their product is sold through selling agents, while 12 other concerns indicated that they sell direct to consumer. Sales to wholesale dealers were reported in 11 instances, and in 5 of these this was the sole distribution channel. A number of companies reported sales through exclusive distributors. Of all of the concerns answering this question 51 stated that their entire output is marketed through a single distribution medium and 41 others reported the use of more than one medium.

Brands or trade-marks.—The use of an identifying brand or trademark on their product was indicated by 26 of the 95 granite concerns. Five companies stated that they employ no such identification, and the others gave no indication of their practice.

Advertising.—The use of advertising was indicated by 77 of the 95 granite companies replying, most of which reported the use of national mediums. Eighteen of these stated that they rely wholly upon direct mail and 16 wholly upon trade journals, while an equal number reported use of both mediums. Several of the companies stated that they advertise in magazines and one firm stated that its advertising is done through a granite association.

Improvements effected.—Of the changes and improvements effected, the most frequently mentioned was accident prevention, which was indicated in about half the replies. The employment of uniform cost accounting was indicated by upward of one-fourth of the companies replying, while 20 replies indicated efforts to improve relations between management and workmen, as well as efforts looking toward continuous plant maintenance. Progress in the standardization of products was reported in 10 instances.

MARBLE

The commercial production of marble in New England is confined almost wholly to Vermont, a small amount from Massachusetts being the only other product from this section. For many years Vermont, with its deposits of high-grade marble, has been the leading State of the United States in the marble industry, the other important producing States being Georgia, Tennessee, and Missouri. In 1925 the reported marble production of these three States outside New England was valued at $6,709,000, while that of Vermont was $5.144.000, representing 37.1 per cent of the national total. In Vermont the production of marble represented about 40 per cent of the total value of the stone production of that State in 1925 and 38.4 per cent in 1926.

For all New England the value of marble produced in 1925 represented about 19 per cent of the total stone production of the region. The value of all marble produced in the entire United States in that year was only a little more than the total value of granite produced in New England.

SLATE

The commercial production of slate in New England is confined to Vermont and Maine, their product in 1925 having a value of $4,567,000 and representing 36.3 per cent of the total national production. Vermont, with an output of $3,963,000, is the principal producer of slate, with 31.5 per cent of the national total to its credit, and is surpassed in this production only by Pennsylvania. The principal slate product is roofing, while mill stock, granules, slate flour, flagging, switchboard bases, vaults, and billiard-table bases are secondary products.

LIMESTONE AND LIME

Limestone is produced commercially in several parts of New England for sale either as rough stone or as burned lime. The principal production is in western Massachusetts and along the Maine coast, particularly in the vicinity of Rockland. Lime has been sold and shipped from this latter place to points along the Atlantic coast and the Gulf for more than a century. Considerable quantities of lime and limestone are used in various New England industries, particularly in paper making, sugar refineries, tanneries, metallurgy, and certain other chemical industries, as well as in agriculture and in building and construction work. In the production of lime Massachusetts has been since 1917 the leading State of New England. Maine holds second place, and the combined output of Connecticut and Vermont approximates that of Maine. Some falling off from 1925 to 1927 is observed in the manufacture of lime, as is shown in the following table.

MANUFACTURE OF LIME IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	9	581	816	1,421	2,933	1,511
1925	10	586	793	1,419	3,307	1,888
Connecticut:						
1927	6	179	250	338	705	368
1925	6	236	306	405	907	503
Vermont:						
1927	8	170	202	344	700	356
1925	9	202	211	406	782	376
Maine:						
1925	5	457	101	742	1,745	1,003
Total:						
1927	23	930	1,268	2,103	4,338	2,235
1925 [1]	30	1,481	1,411	2,972	6,742	3,771
United States:						
1927	260	10,903	12,191	17,269	41,587	24,318
1925	283	12,095	14,002	20,049	50,736	30,687
New England as per cent of United States in 1925	10.6	12.2	10.1	14.8	13.3	12.3

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[1] Exclusive of 1 establishment in Rhode Island.

CLAY AND CONCRETE PRODUCTS

Besides the foregoing products of the stone industries, the making of clay products, consisting principally of brick and tile, was represented in 1927 by 86 establishments in the six States, whose product had a value of nearly $7,000,000. In this production Massachusetts and Connecticut are of approximately equal importance, that of each State exceeding $2,500,000. New Hampshire and Maine each produced a value of less than $1,000,000. The only States reporting the production of pottery, in small amounts, were Massachusetts and Connecticut. The importance of clay products and refractories in each of the producing States is shown for 1927 and 1925 in the next table.

MANUFACTURE OF CLAY PRODUCTS OR REFRACTORIES IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	31	796	1,033	746	2,760	2,014
1925	30	887	1,145	670	2,607	1,937
Connecticut:						
1927	27	936	1,279	689	2,659	1,970
1925	26	897	1,322	736	2,516	1,780
New Hampshire:						
1927	12	288	407	198	812	614
1925	12	289	406	202	828	626
Maine:						
1927	16	236	276	262	684	422
1925	13	204	254	181	619	438
Total:						
1927	86	2,256	2,995	1,895	6,915	5,020
1925 [1]	81	2,277	3,127	1,789	6,570	4,781
United States, 1925	1,939	102,777	127,127	100,013	333,730	233,717

[1] Exclusive of 1 establishment in Rhode Island and 3 in Vermont.

The making of concrete products, consisting mainly of building blocks, pipe, tile, garden furniture, and fence posts, was reported from 121 establishments in five of the New England States in 1927, employing 1,333 wage earners and making products aggregating in value nearly $6,000,000. These products are mainly for local consumption, constituting a supply of building and construction materials for use within New England. Their importance in the individual States is shown in the table. Substantial increases in the 2-year interval following 1925 appear in most of the States.

MANUFACTURE OF CONCRETE PRODUCTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	79	738	1,275	1,078	3,503	2,425
1925	42	556	995	797	2,780	1,983
Connecticut:						
1927	23	437	636	368	1,589	1,221
1925	21	613	921	382	1,920	1,538
Rhode Island:						
1927	14	142	263	416	803	386
1925	9	34	53	55	167	112
Maine:						
1927	5	16	20	18	50	33
1925	4	18	20	27	62	35
New Hampshire:						
1925	3	9	11	15	42	27
Total:						
1927	121	1,333	2,195	1,880	5,945	4,065
1925	79	1,230	2,000	1,276	4,971	3,695
United States:						
1927	2,330	17,808	24,898	33,913	93,259	59,346
1925	1,666	14,722	20,761	27,792	75,214	47,422

NEW ENGLAND MARKET FOR BRICK AND FOR SEWER PIPE

[NOTE.—The section on brick and sewer pipe and that on Portland cement were prepared by Edwin Bates of the Domestic Commerce Division.]

BUILDING BRICK

Although no figures are available as to the consumption of building brick in the New England States, the market of this region is believed to be supplied practically by its own production. Only limited quantities of brick are shipped out of the region, and these are probably offset by incoming shipments from adjacent sources. The production statistics may thus be taken as a fair indication of the amount of New England consumption.

Production of common building brick in 1925 was reported by 80 establishments in four States—Connecticut, Massachusetts, New Hampshire, and Maine—and amounted to upward of 352,000,000, with a stated value exceeding $5,300,000. The principal producing State is Connecticut, which contributed 45 per cent of the total and together with Massachusetts represented 80 per cent of the New England production. The figures for the individual States are as shown in the following table.

PRODUCTION OF COMMON BRICK IN NEW ENGLAND STATES IN 1925

State	Establishments	Production in thousands	Total value
Connecticut	25	166,552	$2,397,491
Massachusetts	27	124,769	1,901,336
New Hampshire	11	41,497	721,837
Maine	17	19,207	310,642
Total	80	352,025	5,331,306

There is practically no production of face brick within New England, but a special type, known as the Harvard brick, made by three or four companies located in Massachusetts and New Hampshire, is quite widely used for facing purposes. This product has a wide sale in New England and some sale on the outside. Production of sand-lime brick in the State of Maine has been increasing. There is no production of fire brick reported in New England, and none of paving brick. Only limited shipments of paving brick are made into the region on account of the high cost of freight from the producing centers and the prevailing use of other materials for paving.

As indicated by the deliveries of a large brick manufacturer over a period of years, the seasonal peak of brick sales occurs in June and declines very rapidly after October and through February. Some attempts have been made by manufacturers to reduce the sharp seasonal curves in this business by educating contractors to the practical advantage of building with brick in the winter.

SEWER PIPE

Estimates by the trade are to the effect that New England cities and towns consume yearly about 6,000 carloads of vitrified-clay sewer pipe. Of this amount the New England production is estimated to be from 1,100 to 1,200 carloads, and the remainder is purchased from the outside. Of shipments from the outside it is estimated in the trade that 55 per cent originates in Ohio and 45 per cent in Pennsylvania.

New England is limited in its production of sewer pipe in the same manner as in that of paving brick. Satisfactory deposits of clay which are vitrified at high temperature are extremely limited. It is reported that various companies which have made surveys for the purpose of locating satisfactory clay deposits in these States have been unable to find such deposits. Production of vitrified-clay pipe in New England depends largely upon the shipment of clay of the required quality from New Jersey.

Apparently little use is found in New England for cast-concrete sewer pipe, or for iron or steel pipe for sewerage purposes. A limited amount of cast-iron pipe, rejected for water or gas service, is sold for sewer construction, and concrete channels for carrying sewerage are used to some extent. An objection to the use of concrete pipe arises from the fact that the construction of a concrete base is frequently necessary, and this makes the project practically as costly in the long run as to build a concrete trench at the outset. Construction of brick sewer mains is practically a thing of the past, largely on account of the high labor cost.

In northern New England sewer construction begins generally about April 15 and continues until the middle of November; in southern New England construction generally begins before April 1 and continues until about December 1. No practical way appears for eliminating the high seasonal factor, inasmuch as the cost of construction is greatly increased by the slowing down of operations from the freezing of the ground. Aside from certain limited types of preparatory work, such as rock blasting, practically nothing is done in the way of sewer construction during the winter months.

Contracts for sewer pipe are generally closed by New England cities during the months of April and May, specifying shipments at the option of the buyer. Frequently these shipments are delayed as late as August or September, and this delay necessitates the stocking of pipe at the factories. The manufacturers do not appear to favor shipments during the off season, as is the practice with the makers of cast-iron pipe. Apparently no discounts are offered for purchases during the off season.

NEW ENGLAND MARKET FOR PORTLAND CEMENT

In the past New England has been wholly dependent upon outside sources to meet its demands for cement required in the construction of roads, pavements, and sidewalks; sewers, hydroelectric and harbor development; public, commercial, and residential building; and for farm uses. The establishment of producing plants near Rockland, on the coast of Maine, is a new development, which is of significance in New England construction work. This new industry, by using local or near-by supplies of limestone, gypsum, and clay, only a short distance from tidewater, is expected to furnish ultimately a considerable portion of the New England requirements for Portland cement.

Since this section of the country has reached a relatively high stage of development in its construction, the amount of new construction, year by year, requiring cement is comparatively small. Much of the highway and street construction was completed some years before concrete had been generally adopted for these uses, and other basic materials are found satisfactory to meet the requirements of local conditions. There is also a relatively small amount of construction of commercial and industrial buildings of the types using reinforced concrete.

In terms of per capita consumption of cement, New England ranks low in comparison with other sections of the country. The total consumption of Massachusetts, Connecticut, and Rhode Island, according to reports of the Bureau of Mines, is only 3.7 per cent of that for the entire country.

In recent years, however, certain factors have stimulated the use of cement, especially in the southern portion of New England. There has been extensive construction of educational buildings and of garages and considerable activity in the building of apartment houses and commercial structures. This has been true particularly in the metropolitan area of Boston and in several of the other commercial centers. Members of the cement trade state that this activity has been a distinct factor in increasing the consumption of cement in the New England market. In the construction of the other large types of building, however, structural steel often replaces reinforced concrete because the necessary strength is thus secured with a smaller volume and weight of construction materials. The annual shipment of cement into New England from domestic and foreign sources is upward of 7,000,000 barrels a year. The total amount has increased each year since 1923, and in 1927 it exceeded 7,500,000 barrels.

The three States of southern New England absorb about 85 per cent of the total cement shipments into New England. Shipments of domestic cement into the three northern States—Maine, New Hampshire, and Vermont—during the five years from 1924 to 1928 averaged about one-sixth of all domestic shipments to New England and imports into the customs districts of these States were about one-eighth of the total for all New England customs districts. The comparatively low value of cement and the high local freight rates are factors which operate to prevent any extensive shipment from one section to another; hence the figures of shipments by States may be taken as a fair indication of the consumption of the individual States.

Of the States of northern New England Maine ranks first in volume of cement shipments; New Hampshire comes second, and Vermont third. A reason for the low consumption in these States is the relatively small amount of road construction or street paving with concrete surfaces or concrete base. There is also little construction of commercial and industrial buildings with reinforced concrete. The cement market in the State of Maine, however, was stimulated during the last few years by the construction of hydroelectric plants. Domestic shipments into that State in 1926 were 60 per cent greater than those of the year preceding, and a large part of this increase came from the demands for hydroelectric construction.

SEASONALITY OF SHIPMENTS

As cement is stored to only a limited extent, the volume of shipments is fairly indicative of the rate of consumption. There is pronounced seasonality in shipments to the New England territory on account of the limitations imposed by winter weather upon construction activity. The seasonality is, therefore, generally more pronounced in the northern section.

Movement into the northern New England States begins actively in the month of April, and shows a fairly steady rise in the months immediately following. Highway construction usually begins the latter part of April, and contracts are frequently completed by August 1. Building contracts awarded during the summer usually call for completion before the end of the season. Heavy shipments of cement usually continue through September and October; then they show a very sharp decline. Cement shipments into Maine during the seven months from April to October comprised 83 per cent of the yearly average for 1924, 1925, and 1926, and shipments in the five months from November through March were only 17 per cent. In Vermont the winter shipments were only 14.6 per cent of the year's total, while in New Hampshire they were approximately 25 per cent. In the three States of southern New England the shipments from April to October, inclusive, were from 76 to 79 per cent of the year's total, and the winter shipments were from 21 to 24 per cent. Percentages for the individual States are shown, by months, in the following table.

Seasonality of Domestic Shipments of Cement Into New England States, 1924–1926

Month	Average monthly percentage of yearly total					
	Maine	New Hampshire	Vermont	Massachusetts	Connecticut	Rhode Island
January	2.80	3.06	3.27	3.30	2.42	2.69
February	2.76	3.57	1.87	2.99	2.27	2.33
March	4.96	5.86	3.49	6.31	5.14	6.09
April	8.24	9.13	7.57	9.79	8.74	10.21
May	10.68	9.75	9.81	11.33	10.68	12.41
June	12.53	10.32	15.84	10.92	10.82	12.45
July	12.54	11.14	12.09	11.37	11.35	10.30
August	15.32	12.04	14.45	11.06	11.56	10.29
September	13.64	11.49	14.02	10.80	13.15	10.15
October	10.27	11.28	11.63	10.70	12.64	12.12
November	4.51	7.68	4.42	7.80	7.93	7.29
December	1.68	4.60	1.50	3.55	3.24	3.59
April–October, inclusive	83.22	75.15	85.41	75.97	78.94	77.93
November–March, inclusive	16.78	24.85	14.59	24.03	21.06	22.07

Efforts toward reducing the seasonality in the cement market by stimulating concrete construction during the winter months have been made during the past few years by the Portland Cement Association and by individual manufacturers. While definite figures are not available as to the degree of success in this direction, there is considerable evidence that the efforts to increase winter construction activity have been effective. Large contracting firms, equipped with the necessary skill and courage to undertake winter construction, now carry on projects throughout the winter from December to April, thus keeping their force at work and eliminating the necessity of obtaining new labor at the opening of the construction season in the spring. In particular, concrete construction on the hydroelectric projects along the coast of Maine were carried on through the winter, and as a result shipments of cement into Maine in January and February of 1926 were 15,000 barrels greater than in the year preceding.

DOMESTIC SOURCES

The domestic supplies of cement for the New England market come almost entirely from two regions. The nearest of these is along the Hudson River in New York State, and the other is the Lehigh district of eastern Pennsylvania, which is the oldest cement-producing center in the United States. Large shipments are made from this district each year into New England, but no figures are available to indicate the relative importance of the two sources. Variations in transportation charges between the two districts are not a factor in competition to New England points. The railway transportation charges from Lehigh and other districts are absorbed by the manufacturer, and prices are quoted on a delivered basis. On account of the bulky nature and relatively low value of the product every effort is made to avoid unnecessary handling, and only a limited redistribution from large commercial centers takes place. Shipments are made direct to the point of consumption, in so far as possible, and there is very little reloading for distribution to small outlying centers. Loading figures of cement shipments by the New England railroads, with the exception of the Boston & Albany, are small. The following table shows the domestic shipments into each of the States of New England from 1923 to 1927.

Domestic Shipments of Cement Into New England States, 1923–1927

[In barrels of 376 pounds]

State or region	1927	1926	1925	1924	1923	5-year total	Yearly average
Maine	505, 952	548, 155	333, 829	386, 593	510, 339	2, 284, 868	456, 974
New Hampshire	459, 706	438, 350	426, 138	378, 554	359, 574	2, 062, 322	412, 464
Vermont	393, 294	271, 615	217, 286	300, 102	234, 182	1, 416, 479	283, 296
Total, 3 northern States	1, 358. 952	1, 258. 120	977, 253	1, 065, 249	1, 104, 095	5, 763, 669	1, 152, 734
Massachusetts	2, 820, 132	2, 982, 987	3, 418, 028	3, 359, 553	3, 124, 238	15, 704, 938	3, 140, 988
Connecticut	2, 061, 892	1, 856, 786	1, 758, 443	1, 582, 312	1, 441, 271	8, 700, 704	1, 740, 141
Rhode Island	700, 851	634, 626	711, 391	608, 355	509, 584	3, 164, 807	632, 961
Total, 3 southern States	5, 582, 875	5, 474, 399	5, 887, 862	5, 550, 220	5, 075, 093	27, 570, 449	5, 514, 090
Total, New England domestic shipments	6, 941, 827	6, 732, 519	6, 865, 115	6, 615, 469	6, 179, 188	33, 334, 118	6, 666, 824
Total, New England imports	605, 817	703, 426	408, 127	88, 760	101, 169	1, 907, 299	381, 460
Total, domestic and foreign	7, 547, 644	7, 435, 945	7, 273, 242	6, 704, 229	6, 280, 357	35, 241, 417	7, 048, 283

FOREIGN SOURCES

Imports of cement from foreign countries at the port cities of New England have shown a pronounced increase in the past few years, a maximum of 703,426 barrels being recorded in 1926. Most of these imports are received at the port of Boston. Imports into the customs districts of northern New England are not large, the amount ranging from 44,000 to 87,000 barrels since 1924. The maximum was reached in 1925. The 5-year total for all New England, from 1924 to 1928, was approximately 2,300,000 barrels, making a yearly average of approximately 476,000 barrels. Figures of imports into the various customs districts of New England for the last five years are presented in the following table.

Imports of Cement into New England Customs Districts, 1924–1928

[In barrels of 376 pounds]

Districts	1928	1927	1926	1925	1924	5-year total	Yearly average
Maine and New Hampshire:							
Free	15, 012	36, 120	79, 687	----------	2, 949	133, 768	26, 754
Dutiable	35, 323	6, 482	566	32, 492	375	75, 238	15, 048
Vermont:							
Free	----------	----------	----------	191	----------	191	38
Dutiable	974	1, 518	1, 513	54, 189	27, 237	85, 431	17, 086
Total, northern New England	51, 309	44, 120	81, 766	86, 872	30, 561	194, 628	58, 926
Massachusetts:							
Free	470, 090	476, 541	551, 129	170, 591	55, 470	1, 723, 821	344, 764
Dutiable	250	5, 000	62, 083	150, 664	2, 729	220, 726	44, 145
Rhode Island:							
Free	54, 036	80, 156	----------	----------	----------	134, 192	26, 838
Connecticut:							
Free	----------	----------	8, 448	----------	----------	8, 448	1, 690
Total, southern New England	524, 376	561, 697	621, 660	321, 255	58, 199	2, 087, 187	417, 437
New England:							
Free	539, 138	592, 817	639, 264	170, 782	58, 419	2, 000, 420	400, 084
Dutiable	36, 547	13, 000	64, 162	237, 345	30, 341	381, 395	76, 279
Total New England, free and dutiable	575, 685	605, 817	703, 426	408, 127	88, 760	2, 381, 815	476, 363

About 90 per cent of the cement imported into the New England States comes from Belgium free of duty. The remainder, paying duty, comes from France, Denmark, Norway, Germany, Canada, and a few other countries. Free entry of cement is extended to countries which levy no duty against the American product. The figures of annual imports into the New England customs districts are shown by country of origin for 1926 in the following table.

IMPORTS OF ROMAN, PORTLAND, AND OTHER HYDRAULIC CEMENTS INTO NEW ENGLAND CUSTOMS DISTRICTS, BY COUNTRIES OF ORIGIN, CALENDAR YEAR 1926

[In tons of 2,240 pounds]

Country of origin	Maine and New Hampshire	Vermont	Massachusetts	Connecticut	Total
Belgium	11, 851		88, 421	1, 418	101, 690
France			8, 915		8, 915
Denmark			3, 707		3, 707
Norway			1, 506		1, 506
Netherlands	1, 525				1, 525
United Kingdom			383		383
Canada	95	254			349
Total	13, 471	254	102, 932	1, 418	118, 075

NOTE.—There were no imports into Rhode Island.

METHODS OF MERCHANDISING CEMENT

Eighteen cement companies were engaged in the sale of cement in the southern New England States in 1927; 15 companies were operating in Maine and Vermont; and 17 companies in New Hampshire. The bulk of the trade is in the hands of about one-half of these companies. Most of them maintain regional offices in Boston, but there is no uniformity in the territory covered. A few companies assign all six New England States to their Boston headquarters; others cover the New England district with the exception of Connecticut; and some assign the New England States with the exception of portions of Massachusetts and Connecticut west of the Connecticut River, which are included in the territory of their New York office.

The manufacturer usually assigns 1 salesman to Maine, 1 to New Hampshire, 1 to Vermont, 3 or 4 to Massachusetts, 1 to Rhode Island, and 2 or 3 to the State of Connecticut. These salesmen keep closely in touch with construction developments, particularly with projects in which cement is to be used. The manufacturers' salesmen have authority to quote prices, close the sale, and assign the contract to one of the dealer representatives. The dealer's salesmen keep in touch with developments and cooperate with the salesmen of the manufacturer. The usual trade allowance for the dealer is 10 cents per barrel, with an additional 10-cent allowance for payment within 30 days. An additional charge is made for cement in cotton bags, with a discount for the returned bags. The credit risk of the purchaser is assumed by the dealer.

None of these companies operate their own warehouses for carrying stocks at any point in the New England area. Some companies watch carefully the stocks of their principal dealers, to assure a sufficient supply to meet the usual demand of the cement trade.

FOOD MANUFACTURES AND TOBACCO

Although the food-manufacturing activities of New England do not compare in volume with its major industries, they are of significance because the consuming population of the region is dependent upon them in considerable measure for its food requirements. These industries, in particular, provide an important market for products of New England agriculture and fisheries. In some lines, notably confectionery and fish products, a considerable portion of the output is marketed outside New England and thus brings in an income from other parts of the country.

The various food-manufacturing industries in 1925 contributed approximately $123,000,000 to the manufacturing revenue of New England, as shown by the value added by manufacturing. The gross value of all of these food products exceeded $350,000,000. In addition to the primary raw materials, these industries provided a market for materials, including fuel and other supplies, valued at upward of $230,000,000 and provided employment to more than 36,000 wage earners who were paid upward of $42,000,000 in wages.

The largest items in this total are bakery products and confectionery. The manufacture of bread and bakery products in 1927 added more than $55,000,000 to the region's revenue, and comprised 45 per cent of the value added by all the food manufactures, with a gross output exceeding $113,000,000 in value. The manufacture of confectionery, with products having a gross value exceeding $53,000,000, added nearly $23,000,000 to the income of New England and represented 21 per cent of the group total. Manufacture of meat products was the source of upward of $11,000,000 in revenue, representing 10 per cent of the group total. The canning and preserving of fruits, vegetables, and fish products contributed a little less than $9,000,000, comprising 9 per cent. The manufacturing revenue from dairy products, including ice cream, butter, cheese, and condensed milk, was nearly $14,000,000, the major portion of which was derived from ice cream. Manufacture of various other food preparations added to the region's revenue about $5,000,000, comprising 5.6 per cent of the income from these food manufactures. The income from chocolate and cocoa in Massachusetts was about $3,200,000. The importance of each of these items in 1927 and in 1925, as far as can be shown by the census figures, is indicated in the following table. This table does not include flavoring extracts and sugar refining, which would add materially to the total.

Manufacture of Food and Kindred Products in New England, 1925 and 1927

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
FOOD PRODUCTS						
Bread and other bakery products:						
1927	1,714	13,509	17,922	58,012	113,662	55,651
1925	1,735	13,538	18,374	58,127	106,903	48,775
Confectionery group:						
1927	210	9,940	8,695	46,329	72,406	26,077
1925	199	9,375	8,701	40,431	70,061	29,630
Confectionery—						
1927 [1]	198	9,034	7,807	30,602	53,448	22,846
1925 [2]	190	8,299	7,312	27,626	52,557	24,931
Chocolate and cocoa—						
1927 [3]	12	906	887	15,728	18,958	3,230
1925 [4]	9	1,076	1,389	12,806	17,504	4,698
Dairy manufactures:						
1927	363	2,094	2,988	19,145	32,951	13,807
1925	389	2,774	3,861	21,443	34,631	13,208
Ice cream—						
1927	284	1,939	2,797	14,389	27,400	13,012
1925	270	2,266	3,220	12,693	24,075	11,382
Butter, cheese, and condensed milk—						
1927 [5]	79	155	192	4,756	5,551	795
1925	119	508	640	8,730	10,556	1,826
Slaughtering, meat packing, and sausage making:						
1927 [1]	149	4,179	5,509	64,422	75,758	11,336
1925 [6]	144	4,195	5,432	65,600	77,043	11,443
Canning and preserving:						
1927	203	4,242	3,102	16,570	25,485	8,914
1925	233	4,399	3,515	19,664	30,346	10,681
Fish, clams, lobsters, etc.—						
1927 [7]	86	2,805	1,919	8,417	13,103	4,686
1925 [8]	85	2,799	2,087	9,804	14,886	5,082
Fruits, vegetables, etc.—						
1927 [9]	117	1,437	1,183	8,153	12,382	4,229
1925 [8]	148	1,690	1,428	9,860	15,460	5,600
Miscellaneous food preparations:						
1927 [10]	51	711	785	4,188	9,220	5,033
1925	107	1,135	1,271	8,754	15,276	6,522
Flour, feed, etc.:						
1927	137	444	503	10,054	11,506	1,453
1925	185	619	699	15,255	17,985	2,730
Total New England:						
1927	2,827	35,119	39,504	218,720	340,989	122,269
1925	2,992	36,035	41,853	229,255	352,245	122,990
KINDRED PRODUCTS						
Beverages:						
1927	422	1,804	2,406	7,512	19,444	11,932
1925	375	1,865	2,663	8,491	20,051	11,559
Cigars and cigarettes:						
1927 [7]	101	2,386	2,806	4,122	9,651	5,529
1925 [11]	127	2,864	3,379	5,141	11,653	6,512

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[1] Not including New Hampshire and Vermont.
[2] New Hampshire, 3; Vermont, 3.
[3] Not including New England States, except Massachusetts.
[4] Connecticut, 1.
[5] Not including Maine, New Hampshire, and Rhode Island.
[6] Connecticut, 4; New Hampshire, 5; Vermont, 1.
[7] Not including New Hampshire, Rhode Island, and Vermont.
[8] Rhode Island, 1.
[9] Not including Connecticut, New Hampshire, and Rhode Island.
[10] Not including Maine, New Hampshire, Rhode Island, and Vermont.
[11] New Hampshire, 5; Vermont, 2.

BAKERY PRODUCTS

The making of bread and other bakery products is distributed over New England largely according to the distribution of population. There are a number of large baking companies in the principal centers of population, and a great many smaller establishments serving their local communities. This industry has had a great expansion in the last decade, in consequence of the improved facilities for rapid transportation, as well as changes in household habits. Great improvements have been made also in bakery equipment and marketing organization.

Comparative figures for the individual States are shown for 1927 and 1925 in the following table, with New England totals also for 1914 and 1904. There was in 1927 about the same total number of wage earners, but a considerable increase in the gross value of products and in net revenue as shown in the value added by manufacture.

MANUFACTURE OF BREAD AND OTHER BAKERY PRODUCTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	1,044	8,473	11,028	37,102	73,706	36,604
1925	317	2,179	3,329	9,098	16,254	7,156
Connecticut:						
1927	290	2,099	3,128	8,934	17,435	8,501
1925	317	2,179	3,329	9,098	16,254	7,156
Rhode Island:						
1927	133	1,246	1,651	4,864	9,377	4,513
1925	132	1,260	1,654	5,164	9,206	4,042
Maine:						
1927	127	946	1,113	3,584	6,894	3,310
1925	121	803	884	3,360	6,187	2,827
New Hampshire:						
1927	76	466	620	2,072	3,785	1,713
1925	86	541	710	2,428	3,883	1,454
Vermont:						
1927	44	279	382	1,456	2,465	1,009
1925	48	326	407	1,560	2,527	967
Total:						
1927	1,714	13,509	17,922	58,012	113,662	55,651
1925	1,735	13,538	18,374	58,127	106,903	48,775
1914	2,529	12,775	7,882	28,611	51,036	22,425
1904	1,930	9,280	5,154	17,798	30,674	12,876

Replies to a special inquiry covering individual sales of 26 baking companies ranging in size from $26,000 to more than $1,000,000, showed, for the group, average annual sales of $421,000 in 1925. A number of these companies maintained branch plants. The average output as reported was 76 per cent of their capacity, and sales of all manufacturers were reported as made entirely within New England. A general increase in sales was indicated in the past few years, which was attributed to extension of sales territories and to the application of more energetic selling methods. Most of these companies make use of local advertising through the newspapers. The average cost of advertising, as indicated by 26 concerns, was 3.7 per cent of their total sales. The average selling costs, exclusive of advertising, were 15.4 per cent of total sales. Their main method of distribution was stated to be direct to the retailer, but a considerable number supplement this by sales through wholesalers or exclusive distributors, and some maintain retail stores.

THE CONFECTIONERY INDUSTRY

The manufacture of confectionery, including candies, nuts, stuffed fruits, and similar products, is one of the substantial industries of New England, adding in 1927 about $23,000,000 to the revenue of the region from the processes of manufacture and giving employment to some 9,000 wage earners, who made products with a gross value of $53,448,000. This is exclusive of the manufacture of chocolate and cocoa, in which 12 Massachusetts concerns in 1927 made a product valued at $18,958,000; and of maple products, in which the value of the Vermont production in 1925 was $3,150,000, representing 74 per cent of the New England output of maple products.

LOCALIZATION

The confectionery industry is concentrated largely in Massachusetts, which contributed 95 per cent of the total New England manufacturing income from confectionery; Boston and Cambridge are the centers of outstanding importance in New England. Connecticut contributed less than 4 per cent, and the other States minor amounts.

In 1925 New England contributed 14.5 per cent of the total national manufacturing income from confectionery. This income in Massachusetts showed an increase of 180 per cent in 1925 over 1914, in comparison with the growth of 191 per cent for the entire United States. New England has thus held its national position in this line better than in some other lines of manufacture. Statistics of production for the individual States in 1927 and 1925, and comparative totals for 1904 and 1914, are presented in the following table. Some increase in activity since 1925 is indicated in the increase in number of wage earners and of establishments. There was a slight increase in the gross value of the product, but, on account of a considerable increase in cost of materials, there was a falling off of some $2,000,000 in the revenue derived from this industry. Massachusetts reflects this general situation. In Connecticut there was some increase in net revenue and a considerable increase in gross value of product. In Maine and Rhode Island there was some falling off.

Manufacture of Confectionery in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	148	8,373	7,244	28,308	49,674	21,366
1925	134	7,625	6,755	25,843	49,334	23,491
Connecticut:						
1927	20	414	368	1,649	2,752	1,103
1925	21	434	356	1,123	2,064	941
Maine:						
1927	19	88	71	279	483	203
1925	23	110	82	254	467	212
Rhode Island:						
1927	11	159	125	365	539	174
1925	12	130	118	405	692	287
Total:						
1927	198	9,034	7,807	30,602	53,448	22,846
1925 [1]	190	8,299	7,312	27,626	52,557	24,931
1914	244	8,183	3,084	14,003	22,947	8,915
1904	150	4,819	1,524	6,436	10,964	4,528

[1] Not including New Hampshire, 3; Vermont, 3.

CONDITIONS IN THE INDUSTRY

Size and age of establishments.—In response to an inquiry sent to every New England manufacturer of confectionery, replies were received from establishments whose combined sales represented approximately 75 per cent of the total New England output. These replies are representative both of large and of small plants, as they include individual concerns with sales volume ranging from as low as $18,000 up to $6,000,000. Included in the group were 11 concerns doing an individual business exceeding $500,000, and 10 others with individual sales between $100,000 and $500,000. The average period of operation for the group was 20 years, and the average period under present management was 12 years. The oldest concern in Massachusetts had been in business for 75 years, and the oldest in Connecticut 26 years.

The confectionery business is, in general, a localized industry, although the larger concerns have a wide distribution of product. Branch plants were reported by one-fifth of the companies replying, but in only one instance were these branches located outside New England. The principal factors determining the location of plants in this industry are accessibility of markets and facilities for distribution.

Additions to plant capacity since 1921 were indicated by one-fourth of the companies replying. The 1925 output of the companies which had increased their capacity did not exceed, in any case, 80 per cent of their maximum capacity; the average output in 1925 for the entire group was 67 per cent of full capacity.

Raw materials.—The principal raw materials reported are sugar, chocolate and cocoa, butter and milk, and flavoring extracts. Most of these are obtained from New England sources, but chocolate and cocoa were reported to be purchased generally outside New England.

Manufacturing practices.—The use of wage incentives was indicated by approximately one-half the group, with an average of 28 per cent of their employees paid on some form of bonus or piecework basis. A number of the concerns, however, reported from 70 to 90 per cent of their workers on some incentive plan of payment. The replies indicated the low period of activity in the early spring, with gradual recovery to peak activity in the fall of the year. Several concerns reported success in overcoming seasonal periods by the introduction of supplementary products. One-third of the replies indicated some progress along this line. Of various other improvements mentioned, the largest number of concerns indicated that they were giving attention to standardization of their products.

Sales trends.—The trend of sales from 1921 to 1925 of these representative companies showed a gradual but continuous increase, with the exception of some falling off in 1922. One-half of the companies reported individual increases in sales during the last five years, while one-fourth reported decreasing sales and the rest showed no material change. Among those whose business had increased, the largest number stated that extension of territory and new sales methods were the principal contributing factors; while the companies with decreasing sales volume attributed the falling off to competition from other sections and to new elements in the confectionery business.

Location of markets.—The local nature of the market in this industry is indicated by the fact that four-fifths of the companies reporting stated that they sold a majority of their products within the New England States. The unweighted average of New England sales by individual companies was 78 per cent of their total business. About one-fifth of the companies, which includes the larger concerns, stated that they market their products nationally; but an important proportion of the output of these is absorbed by the New England market. In a few individual cases manufacturers distributed as low as 5 per cent of their product in New England. A small number reported exports of a portion of their output, the average of these being approximately 6 per cent of their total sales. A slight upward trend in these exports is noticeable over the last five years.

Distribution methods.—There are two principal methods of distribution reported for confectionery products. The majority of the manufacturers reported selling direct to the retailer or through wholesalers; and in some instances both outlets were employed. A few concerns market their product through their own stores or through exclusive distributors, and two companies reported selling direct by mail. Consolidation of selling activities for purposes of economy was indicated by a few companies, and a large number stated that they were emphasizing the improvement of sales and marketing methods. The average cost of selling for the whole group of reporting concerns was 9 per cent of their total sales. The outstanding problem in this industry appears to be to retain its present large share of the business in the New England region, which it is best fitted geographically to serve.

Advertising.—Advertising, in the majority of cases, employs local mediums, in which newspapers and dealer helps are most frequent. A number of concerns use billboards and street-car advertising.

Nineteen companies reported that they advertise in national publications.

Statements from executives.—The situation faced by this industry and the policies in regard to manufacture and selling are well indicated by statements of executives of some leading companies. The recent widespread growth of candy kitchens and the growth in sales of small items, such as the 5 and 10 cent bar goods, appear to be the principal competing factors in the confectionery situation. One large confectionery manufacturer states that the candy kitchens, which in many instances make a high-grade candy that appeals to local taste, through the selection of flavors and centers that are especially palatable and which can be manufactured and sold fresh within a limited period of time without impairing their keeping qualities, have probably hurt the sale of high-grade package goods more than any other single item, and he believes that they will be a considerable factor in the future of the candy industry. This executive continued: "The buying public seems inclined to favor candies of this type, where the workmanship is of very ordinary grade without much attempt at decoration or particular care in packing; whereas in package candy of national reputation great insistence is placed upon neat workmanship in the way of decoration, packing, and arrangement of assortments." This manufacturer refers thus to the advent of specialties in the manufacture of 5-cent and 10-cent bar goods:

> Prior to four or five years ago there was a fairly steady demand for 5-cent and 10-cent bars, which probably represented about 25 per cent of the total buying power. These consisted of chocolate-coated cream-center bars, nut-top bars, and here and there a combination center, and they were usually made by national manufacturers as part of a general line. More recently small factories have started specializing on a single bar, or, at most, three or four 5-cent bars of a special type. They have put back of these a very intensive merchandising and advertising campaign which has increased tremendously the sale of these bars, and in many instances this has been at the expense of the old-line type of confectionery. The sale of these bars has also made considerable inroads upon the sale of loose, or bulk, candies and penny goods. This is mainly a tribute to intensive merchandising methods, but it has been made possible by low overhead and large volume resulting from specialization. While the business in bar goods started in a small way its growth and success have been phenomenal, and now these concerns are numbered among the largest in the country.

Another manufacturer, referring to the tremendous increase in demand for 5-cent bars, holds that "the increase in small outlets, such as street stands, and the frequent change in style of goods afforded in this class, has been responsible for a great deal of speculation on the part of the manufacturers, in a feverish attempt to find a piece that will make a strong appeal to the consumer."

From another manufacturer comes this comment regarding retail outlets and transportation costs:

> During the past five years there has been a great increase in the number of small retail stores doing their own manufacturing; confectionery chain stores also have increased their sales volume at a surprising rate, and nationally advertised specialties from time to time have taken their share. The New England manufacturer has been forced to face this local competition, while distant distribution has become even more difficult because of increased freight rates. This freight problem is particularly serious because New England is one of the largest confectionery manufacturing sections, and it is dependent upon national distribution. In consequence of the increased freight rates and western competition there has been a tremendous backing up of New England products, and intensive local competition.

The freight and express charges outside of New England, in the opinion of another executive, represent 5 to 6 per cent of the sales value on the cheaper grades of candy, and 3 to 4 per cent on the higher priced package goods. This handicap was said to be difficult to overcome, in view of the close and narrowing manufacturer's margin on candy, so that such an item, which did not loom large in the past, becomes a serious menace to the sale of candy nationally, where individual concerns do not obtain compensating savings from mass production. In this connection, another manufacturer states that the increase in freight rates since 1914 has tended to localize the market and has restricted sales in territories like Pennsylvania and Ohio, where jobbers prefer to buy from local manufacturers that have developed within the last 8 or 10 years. Another concern, which concentrated its efforts on the sale of a 5-cent product in New England, finds that marketing and merchandising are becoming more difficult in consequence of intense competition.

A company whose product is sold entirely to candy jobbers states that in the past few years the policy of these jobbers has been to buy in smaller lots and more frequently. The company's executive states: "We find that many of these jobbers have difficulty in maintaining sales volume at previous standards, because so many jobbers are entering the field. This fact has led to much price cutting and giving of free deals, and, worst of all, the introduction of petty gambling schemes both in the 5-cent bar and penny-goods market." Regarding changes in type of packages, a large manufacturing concern states that the old policy of putting up goods in plain boxes passed during the war, and that the jobbing trade now buys package goods which are put up in attractive lithographed boxes.

A number of executives submitted the sales methods employed by their companies. One of these states as follows:

> Within New England we sell package goods directly to the retail trade, while bulk and bar candies are sold through jobbing houses. Outside New England in certain parts of the country we operate branches, four in all, which sell direct to the trade; and in other parts of the United States we operate through jobbers on an exclusive basis. The entire United States has been zoned, with a district manager who solicits and handles all trade in his territory, assisted by a specialty man or other assistant who works with the jobbers in developing business. This work is supplemented by advertising in the form of window displays, merchandising helps, and newspaper advertising, which is carried on in an intensive way, section by section. The district manager draws a salary and bonus, while our other men are compensated on a commission basis. Our method of studying the market consists pretty largely of determining the per capita sales of various items in each section; wherever these are below normal or below the highest which we obtain elsewhere, we endeavor, through our district managers, to ascertain the reasons and bring them into line. In many instances we find that local manufacturers dominate their markets so strongly that an attempt to share it does not seem justified.

Another company sells its products exclusively to jobbers, employing 16 salesmen on a straight salary basis with bonus. In the home market, where a greater variety of goods is distributed, the territory is covered more intensively than in distant markets, where there is greater competition and where the company distributes fewer types, the salesman there covering the trade of broader territories less frequently. This company states that its methods of studying the market have been greatly improved. Having a large variety of goods to offer, it combines shipments for various customers so as to obtain carload freight rates by pooling these shipments. Customers are thus encouraged to purchase in substantial quantity for many distant points. The executive of this company states that intensive competition has caused many manufacturers to resort to extreme measures, such as the use of premiums, free goods, extra discounts, prepaid freight, and other valuable considerations, to enlist special selling effort on the part of trade and salesmen. The general effect is said to be demoralizing to the distributing factors in the industry, loss of profit to the manufacturer, and no permanent profit to anyone concerned.

The sales organization of another manufacturer, which sells entirely to jobbers, consists of five salesmen, working on salary, who cover New England, New York, and Pennsylvania, with commission men in New York City, Philadelphia, and Chicago, in the Southern and Southwestern States, in Ohio, and on the Pacific coast. This company states that it secures its market information mainly through its salesmen and through visits of its sales manager in different territories. Another concern employs seven salesmen, on commission basis only, in the territory east of the Mississippi River, generally assigning territory to a man living in that section who has formerly traveled it in the confectionery business. In the sales plan of another concern all New England and the Middle West are covered by three salesmen working on a salary and commission basis, while the South and the extreme West are covered by eight men, working only on commission. Small towns and local territory are covered by four salaried men, designated as store salesmen, who sell in less than case lots.

DAIRY PRODUCTS

Since most of the production of New England dairies is marketed as fresh milk and cream, the manufacture of dairy products is of secondary importance. (See also p. 20.) Of the total milk production in 1924 it has been estimated that about 19.6 per cent went into the manufacture of butter, 1.2 per cent into condensed milk, and less than 0.7 per cent into cheese. It was estimated, also, that a total of more than 100,000,000 quarts of local milk is converted annually into cream and butter. Formerly the greater portion of the milk produced in northern New England was made into butter and cheese—in early years on the farms and later in creameries.

MILK, BUTTER, AND CHEESE

Year-round production of milk for manufacture is now confined chiefly to the sections with the poorest transportation facilities for moving fresh milk to market. The seasonal surplus in fluid-milk territory is also manufactured to a certain extent, but this is done less and less with the growing demand for sweet cream, which absorbs a large share of the surplus supplies. Very little butter is now manufactured on the farms. Cooperative creameries have been important in northern New England for many years. Within the last decade or so many new organizations have been formed, especially in Vermont, which are equipped to sell their product either as butter or as cream, according to market conditions.

The New England output of butter, cheese, and condensed milk had a value of $10,500,000 in 1925, providing a market for materials amounting to $8,700,000 and adding less than $2,000,000 to the regional income from manufacturing activity. There was apparently a considerable reduction in 1927.

ICE CREAM

The manufacture of ice cream is much more important, with a product in 1927 exceeding $27,000,000 in value and adding more than $13,000,000 to the manufacturing revenue of the six States. This is several times the contribution from dairy products in the form of butter, cheese, and condensed milk. Since 1925 there was some increase in number of plants, with a reduction in the reported number of wage earners, with increased value of product and increased revenue. The market for ice cream is supplied mainly from small local establishments, but there are numerous fairly large companies in or adjacent to the important centers of population, which have a wide distribution for their product.

MANUFACTURE OF ICE CREAM IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	162	1, 026	1, 552	8, 215	15, 279	7, 064
1925	151	1, 177	1, 707	7, 304	13, 211	5, 907
Connecticut:						
1927	40	440	620	2, 415	5, 096	2, 681
1925	42	578	825	2, 431	5, 203	2, 772
Rhode Island:						
1927	30	143	209	1, 203	2, 317	1, 113
1925	31	202	307	1, 210	2, 376	1, 166
Maine:						
1927	20	193	218	1, 411	2, 499	1, 087
1925	19	161	203	981	1, 753	772
New Hampshire:						
1927	20	91	127	613	1, 157	543
1925	16	74	89	354	701	347
Vermont:						
1927	12	46	71	531	1, 054	523
1925	11	74	90	412	830	418
Total:						
1927	284	1, 939	2, 797	14, 389	27, 400	13, 012
1925	270	2, 266	3, 221	12, 692	24, 074	11, 382

SLAUGHTERING AND MEAT PACKING

While meats for consumption in New England are, for the most part, shipped in in dressed form from western points, there is some slaughtering of local supplies; but the greater part of this activity is the local slaughter of western livestock shipped in by rail. There are slaughtering facilities in almost all the New England cities where local or western animals are killed. In every important city there are branch houses of the western packers, which receive meat in refrigerator cars and distribute it to their surrounding territory.

Cattle for local slaughtering come into New England mainly from the Corn Belt States, particularly from the Chicago livestock market, but considerable numbers come also from New York and Pennsylvania. The livestock shipped in for slaughtering is converted into meat mostly in the packing houses of greater Boston. The central stock market of New England for generations has been in Boston; this and numerous other cities still retain their local livestock markets. Most of the slaughtering in Boston district is now confined to the Charlestown area and is mainly of western animals, but the Boston market still handles much discarded local dairy stock for slaughter. Hogs are shipped to Boston by the trainload to supply local requirements for fresh pork. Considerable numbers of cattle and lambs are likewise shipped in to meet the Jewish demand for fresh-killed meat.

The importance of slaughtering and meat packing, including sausage making, in New England, is shown by a value of product three times that of the canning and preserving industries, and exceeding these by upward of $2,000,000 in contribution to the manufacturing revenue of the region. In 1927 there were 149 slaughtering and meat-packing establishments in Massachusetts, Rhode Island, Maine, and Connecticut, whose products had a value of $75,758,000, adding more than $11,000,000 to the manufacturing revenue of these four States. The greater part of this industry, as shown by census figures, is in Massachusetts, which represented 86 per cent of the total reported. A practically stable situation is indicated for New England as a whole since 1925, with minor changes in the different States.

SLAUGHTERING, MEAT PACKING, AND SAUSAGE MAKING IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars: Wages	Thousands of dollars: Cost of materials	Thousands of dollars: Value of products	Thousands of dollars: Value added by manufacture
Massachusetts:						
1927	97	3, 635	4, 790	55, 958	65, 335	9, 377
1925	87	3, 673	4, 682	56, 102	65, 490	9, 389
Rhode Island:						
1927	18	242	317	4, 981	5, 929	948
1925	19	243	364	6, 163	7, 332	1, 169
Maine:						
1927	19	184	226	2, 081	2, 622	541
1925	21	184	229	1, 964	2, 434	469
Connecticut:						
1927	15	118	175	1, 402	1, 872	470
1925	17	95	158	1, 371	1, 787	417
Total:						
1927	149	4, 179	5, 509	64, 422	75, 758	11, 336
1925 [1]	144	4, 195	5, 432	65, 600	77, 043	11, 443
1914	183	4, 464	75, 097	58, 375	66, 764	8, 389

[1] Not including Connecticut, 4; New Hampshire, 5; Vermont, 1.

CANNING AND PRESERVING

The canning and preserving of fruits, vegetables, and fish products is an industry which in 1927 contributed about $9,000,000 to the manufacturing revenue of New England, paid $3,100,000 in wages to

4,200 wage earners, and turned out products with a gross value exceeding $25,000,000. The two distinct branches of this group, one having to do with agricultural products and the other with fishery products, are of approximately equal importance as a source of income to the region. In the first group there is a considerably greater number of establishments, but only about half as many wage earners. The outlay for materials is approximately the same, while the value added by fish products since 1925 has become greater than that from fruits and vegetables.

From a national standpoint New England is much more important in the manufacture of fish products than in the canning of fruits and vegetables. These States contribute nearly 25 per cent of the national output of canned and cured fish, but only 2½ per cent of the national production of canned fruits and vegetables.

Recent changes in the canning and preserving of fruits and vegetables have been in the line of material reduction. The number of establishments in New England fell off from 148 in 1925 to 117 in 1927, with corresponding reduction in wage earners and in value of output. In Massachusetts there was a slight increase in value of output, but a substantial falling off occurred in Maine and Vermont.

In the fish-preserving industry there was little change in activity, as shown by number of establishments and of wage earners. In Maine there was considerable falling off in value of output and in net revenue, although Massachusetts shows some increase in gross output.

The distribution of canning and preserving activities, according to the product, is shown for 1925 in the following table from United States census statistics. In the value of total output, Maine was in the lead, with 54 per cent of the New England total; Massachusetts and Rhode Island together contributed 41 per cent. These three States represented 95 per cent of the New England total.

PRODUCTS OF CANNING AND PRESERVING INDUSTRIES IN NEW ENGLAND STATES IN 1925

Item	New England total	Maine	Massachusetts and Rhode Island	Vermont	Connecticut	New Hampshire
Canned vegetables and soups:						
Cases	2, 852, 745	2, 211, 394	290, 318	224, 801	16, 807	2, 211, 394
Value	$8, 382, 747	$6, 251, 301	$1, 141, 264	$633, 114	$51, 759	$305, 309
Pickles, jellies, preserves, and sauces: Value	$5, 648, 646	$243, 508	$4, 844, 694	$56, 000	$504, 444	
Canned fruits:						
Cases	479, 639	370, 121	109, 518			
Value	$1, 731, 091	$1, 337, 357	$393, 735			
Canned fish, etc:						
Standard cases	2, 308, 164	2, 035, 973	272, 191			
Value	$8, 849, 141	$7, 606, 521	$1, 242, 620			
Cured fish:						
Pounds	47, 837, 506	9, 962, 367	37, 875, 139			
Value	$5, 581, 246	$823, 572	$4, 757, 674			
All other products: Value	$815, 918	$415, 884	$400, 034			
Total value	$31, 008, 789	$16, 678, 143	$12, 780. 020	$689, 114	$556, 203	$305, 309

Interviews with executives of some of the large canning companies brought out the statement that the greater proportion of the product is marketed and consumed within New England. It was the opinion that a much larger potential market for their product exists than is now supplied, although the variable production of different years and the unstable price situation have kept down the acreage. Production of sweet corn could be increased moderately in Maine and in other parts of northern New England if justified by market conditions.

Because of the broken topography of the corn-producing section of Maine the production is restricted to small acreages, which limit the size of operations of individual canners. With few exceptions the canning factories in Maine are local enterprises developed by the initiative of local groups of farmers. Largely on account of the small-unit production it has been difficult to bring about cooperative efforts among the canners of the State.

The outstanding problem of the canning industry arises from the extreme seasonal variation which limits activities to a few weeks or months of the year. These activities reach their maximum in the early fall. The cost of equipment and its rapid depreciation in the face of operation for only a short period each year are difficulties peculiar to this industry. Success in overcoming the seasonal variation has been attained by some companies through the addition of supplementary products not dependent upon local agriculture, such as beans and brown bread. Improvements are reported in individual cases in the line of production control and in standardization of products. Sales of representative reporting companies showed a moderate increase in 1923, a slight falling off in 1924, and a substantial increase in 1925. The reason most frequently given for sales increases has been the adoption of new sales methods, and the reason given for decreased sales was competition from outside sections. The principal channels of distribution indicated by reporting companies are wholesale dealers and selling agents, although other channels are used in individual cases.

The logical markets for New England canned goods are the Atlantic coast region and the Pacific coast, where there is a differential advantage in freight costs from water transportation. It was the opinion that in these areas New England canners can compete successfully with the large-scale producers in the interior States. The principal competition comes from Illinois, Wisconsin, and New York.

An executive of one of the leading canning companies stated that less than 10 per cent of the company's product is marketed in the New England States. He stated also that only a small portion of all the canned corn consumed in New England is produced there. Competition comes from the product of other sections because of their lower price. In his opinion there is a large undeveloped market for Maine canned products in the cities along the Atlantic seaboard.

Most of this company's output is sold under its own label, but a portion is sold unlabeled to wholesalers who use their own private brand. Its output is sold mainly to large wholesalers through the agency of brokers who operate on a commission basis. These are widely distributed throughout the country. Advertisements are carried in the leading women's magazines and sometimes in daily papers in the larger centers. In addition to this, sales-promotion campaigns are conducted in cooperation with local wholesalers and retailers, sometimes augmented by house-to-house canvassing in communities where the goods are being newly introduced, as a means of educating the consuming public.

Replies from a representative number of New England canners of fruits and vegetables showed that sales within New England in 1925 averaged 57 per cent of their total business. The average output in that year was 72 per cent of the maximum capacity. The proportion of the product sold under the canner's private label averaged 55 per cent. The principal methods of marketing the product of these representative companies was through wholesalers or selling agents. A few reported some sales direct to consumers.

CANNING AND PRESERVING IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
FRUITS AND VEGETABLES						
Massachusetts:						
1927	32	435	509	4, 367	6, 623	2, 257
1925	31	417	495	3, 736	6, 071	2, 335
Maine:						
1927	78	916	662	3, 517	5, 323	1, 806
1925	99	1, 067	786	5, 194	7, 839	2, 645
Vermont:						
1927	7	86	52	270	436	166
1925	10	90	71	456	688	232
Connecticut:						
1925	5	89	53	279	556	277
New Hampshire:						
1925	3	27	22	195	305	110
New England:						
1927	117	1, 437	1, 183	8, 153	12, 382	4, 229
1925 [1]	148	1, 690	1, 428	9, 860	15, 460	5, 600
1914	144	1, 604	565	3, 980	6, 081	2, 101
1904	95	955	286	1, 244	2, 251	1, 007
United States:						
1927	2, 436	80, 924	62, 310	355, 186	572, 346	217, 160
1925	2, 403	85, 866	67, 427	385, 573	616, 070	230, 497
FISH, CLAMS, AND LOBSTERS						
Maine:						
1927	62	1, 888	905	4, 105	6, 589	2, 485
1925	61	1, 845	1, 180	6, 214	8, 838	2, 624
Massachusetts:						
1927	24	917	1, 015	4, 313	6, 513	2, 201
1925	24	864	908	3, 591	6, 048	2, 458
New England:						
1927	86	2, 805	1, 919	8, 417	13, 103	4, 686
1925 [1]	85	2, 709	2, 087	9, 804	14, 886	5, 082
1914	42	4, 420	1, 645	9, 487	13, 629	4, 142
1904	202	3, 713	1, 512	6, 488	9, 779	3, 291
United States:						
1927	337	12, 650	8, 106	42, 892	65, 082	22, 190
1925	319	10, 530	7, 234	39, 194	61, 061	21, 867

[1] Not including Rhode Island, 1 establishment.

VEGETABLES

In the canning[1] of vegetables the principal item is sweet corn. Small quantities of peas and tomatoes are put up by New England canneries. The sweet corn canned in the three northern States of New England had a value in 1925 of approximately $5,300,000; of this amount Maine produced 85 per cent and Vermont 10 per cent. In 1926 there were 38 corn-canning factories in the State of Maine.

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[1] Discussion of the production of crops for canning is presented in the section on agriculture, p. 39.

In the production of sweet corn northern New England has a high reputation for the quality and flavor of its product. In recent years peas have been grown and canned to a limited extent. Packing began in a small way in 1923, when 18,000 cases were put up in Maine. This was increased to 87,000 cases in 1924, and to 163,000 cases in 1925; there was a sharp reduction in 1926 to 42,000 cases, attributed largely to difficulties of the growers with the green pea louse, which cut down the yield. Tomatoes are canned to a limited extent in the vicinity of Guilford, Conn.

BLUEBERRIES

The canning of blueberries is likewise a distinctive industry in the State of Maine. It is confined to Washington and Hancock Counties, where a combination of favorable climatic and soil conditions, together with cheap land, makes the growing of blueberries commercially profitable. Canneries are scattered throughout this area, bringing to the growers of the region about $750,000 a year.

This industry provides a means of livelihood to much of the scattered population in this section and is the sole or chief source of income to many families. The ripe berries are sold by the growers according to the market at harvest time, as determined by competition among the different canneries. Formerly most of the crop was put up in large cans for sale to restaurants and bakeries. More recently the practice has tended toward putting up blueberries in smaller cans and jars for the family trade. The equipment for the canning of blueberries is comparatively simple and inexpensive, and the limit of the market is said to be determined only by the available supply of the fruit.

In addition to blueberry canning in Maine, the canning of cranberries has assumed some importance in the Cape Cod region of Massachusetts in the last few years. Canning of apples is also of some importance in Maine.

FISH CANNING AND CURING

Establishments engaged in the canning and curing of fish[2] in 1927 had an output in Maine and Massachusetts valued at upward of $13,000,000, of which Maine contributed 58 per cent and Massachusetts 42 per cent. Maine is the leading State in the canning of fish, while Massachusetts leads in salt curing. Fish canning along the coast of Maine is concentrated largely at Eastport and Lubec, on the eastern extremity of the United States coast, where some 14 or 15 large packing establishments employ in the active packing season an average of 100 persons each, of which 70 per cent are women. In 1925 Maine canned 2,036,000 cases of sardines and other fish products.

According to State laws, the packing season in Maine extends from the 15th of April until the 1st of December. The fish-packing plants usually begin their activities about the 1st of May and run with a small force until July; then they carry on full activities until October, according to the run of fish delivered. The work of trimming, boning, and packing fish is done mainly by women, who are paid on a piecework basis.

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[2] Production and marketing of fresh fish are presented in the section on fisheries, p. 85.

The principal center for salt and processed fish is Gloucester, Mass., which is the most important salt-fish packing center in the United States. In Gloucester and in East Boston fish are salted, dried, smoked, filleted, and canned, and the refuse is made into glue, fish oil, and fertilizer. A number of large companies are engaged there in the buying, curing, and marketing of cod, haddock, and other species. A portion of the product finds its market in the Southern States and the West Indies, but the greater part of it is marketed in the eastern part of the United States. The large companies at Gloucester have a national distribution of their product.

The marketing of cured fish has undergone considerable change in the last few years. Efforts at market extension show the necessity of educating people in the interior of the country to the merits of fish as a food. One of the large packing companies has built up a widely extended business based entirely on sales of package fish direct to the consumer, by mail. This business has been expanded by extensive advertising in magazines and by direct mail.

A recent development of great importance in the direct marketing of fish has been the use of insulated containers for mailing, whereby fresh fish are subjected to a quick freezing process which, without refrigeration and without impairing the tissue, enables them to be kept in condition for several days while in transit. A material extension of the trade in package fish has come about in recent years through sale of cut fillets in 1-pound cartons packed for the retail trade. A campaign to popularize fish as a food, by means of booklets of recipes, attractive posters, and store displays, has been supported by farsighted members of the trade, with profitable results.

MISCELLANEOUS FOOD PREPARATIONS

The manufacture of such food products as prepared cereals, baking powder, shortening, potato chips, macaroni, and other prepared foods represented a value in the four States (Massachusetts, Connecticut, Vermont, and Rhode Island) leading in such production in 1925 exceeding $15,000,000 and added to their manufacturing revenue $6,500,000, of which Massachusetts contributed about 75 per cent. The value of the product in 1925 was nearly twice that in 1914, and the number of wage earners was considerably greater. A substantial falling off is noted in 1927, as indicated in the following table.

Manufacture of Miscellaneous Food Preparations in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	45	633	708	3,877	8,592	4,715
1925	68	857	949	5,989	11,337	5,349
Connecticut:						
1927	6	78	76	311	628	318
1925	20	133	165	924	1,473	549
Vermont:						
1925	7	95	98	1,573	2,064	491
Rhode Island:						
1925	12	50	59	268	402	133

FLOUR, FEED, AND OTHER MILL PRODUCTS

The manufacture of flour and of cereal products for New England consumption occurs almost entirely outside New England. These products are shipped in from Buffalo and western points in the finished form. There is some milling, however, in small establishments in certain of the rural sections. The product of the six New England States had an aggregate value in 1925 of approximately $18,000,000 and added to the manufacturing income $2,730,000. Vermont overshadowed the other States, with 46.5 per cent of the total value of the product and 55.8 per cent of the value added by manufacture. The product of Maine and New Hampshire together was about one-half that of Vermont, and that of Massachusetts was less than half the value of product in Vermont. Considerable reduction in this minor industry in each State of New England is observed in 1927.

The output of the six New England States had approximately the same value in 1925 as in 1914 and in 1904. In view of the wide difference in price levels in these years, however, the figures indicate a pronounced reduction in the importance of this industry.

MANUFACTURE OF FLOUR, FEED, AND OTHER MILL PRODUCTS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	32	135	175	3, 746	4, 380	634
1925	39	119	150	3, 277	3, 724	447
Vermont:						
1927	31	126	142	2, 654	2, 929	275
1925	45	192	229	6, 845	8, 369	1, 524
Maine:						
1927	42	76	71	2, 004	2, 233	229
1925	44	134	149	2, 599	2, 906	307
New Hampshire:						
1927	13	68	66	849	1, 030	181
1925	25	91	95	1, 146	1, 389	242
Rhode Island:						
1927	8	18	21	514	582	67
1925	10	45	33	785	859	74
Connecticut:						
1927	11	21	28	287	352	66
1925	22	38	43	603	739	136
Total:						
1927	137	444	503	10, 054	11, 506	1, 453
1925 [1]	185	619	699	15, 255	17, 985	2, 730
1914 [2]	562	903	511	17, 785	17, 793	2, 008
1904 [2]	592	1, 036	526	15, 524	17, 415	1, 891

[1] Includes only establishments doing a business of $5,000 or more.
[2] Includes only establishments doing a business of $500 or more.

MANUFACTURE OF BEVERAGES

The manufacture of beverages in 1925 gave rise to a product exceeding $20,000,000 in value and adding more than $11,500,000 to the manufacturing income of New England. This industry employed 1,865 wage earners and provided a market for materials amounting to $8,500,000. It is of some importance in each State, but Massachusetts represented 75 per cent of the New England total. A relatively slight reduction in activity is noted in 1927, as shown for the individual States in the figures of the following table.

These figures do not include mineral waters. The New England production of mineral waters and soda waters, reported by the Bureau of the Census in 1914, had a value of only $3,877,000 and gave employment to 1,036 workers.

Manufacture of Beverages in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	206	1, 182	1, 651	5, 305	14, 160	8, 855
1925	182	1, 183	1, 759	6, 131	14, 754	8, 623
Connecticut:						
1927	94	271	355	938	2, 372	1, 434
1925	85	334	480	1, 101	2, 601	1, 501
Rhode Island:						
1927	38	151	179	433	1, 100	668
1925	38	145	189	479	1, 111	631
Maine:						
1927	44	95	105	405	873	468
1925	36	92	94	291	626	335
New Hampshire:						
1927	31	78	90	360	749	389
1925	26	90	118	405	774	369
Vermont:						
1927	9	27	25	72	190	118
1925	8	21	23	85	185	100
Total:						
1927	422	1, 804	2, 406	7, 512	19, 444	11, 932
1925	375	1, 865	2, 663	8, 491	20, 051	11, 559
1914[1]	417	1, 036	625	1, 717	3, 877	2, 160
1904	270	919	516	1, 222	3, 028	1, 806

[1] Mineral and soda water.

TOBACCO MANUFACTURE

Tobacco manufactures, including cigars, cigarettes, and chewing tobacco, with a value in New England in 1925 exceeding $11,650,000, contributed to the manufacturing income $6,500,000, and gave employment to 2,864 wage earners, who were paid $3,379,000 in wages. Seventy per cent of the production was in Massachusetts and 20 per cent in Connecticut. The number of wage earners employed in 1925 was only slightly more than half that of 1914, and the value of the product was less in the later year. The figures for 1927 show a substantial reduction since 1925.

Manufacture of Tobacco, Cigars, and Cigarettes in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	53	1,619	1,896	3,064	6,912	3,849
1925	61	1,869	2,356	3,732	8,212	4,480
Connecticut:						
1927	37	647	766	843	2,265	1,421
1925	43	664	763	929	2,370	1,441
Maine:						
1927	11	120	145	215	474	259
1925	11	124	135	205	492	287
Rhode Island:						
1925	12	207	125	274	579	305
Total:						
1927	101	2,386	2,806	4,122	9,651	5,529
1925[1]	127	2,864	3,379	5,141	11,653	6,512
1914[2]	499	5,474	4,212	5,312	12,451	7,139
1904	744	5,722	3,587	3,967	10,433	6,466

[1] Not including New Hampshire, 5; Vermont, 2.

[2] Not including Connecticut, 4 establishments.

CHEMICALS AND DRUGS

The manufactures which are based upon the use of chemical materials or chemical processes include a considerable number of diverse products which are grouped here for convenience, despite the wide diversity in processes of manufacture and in type of market. This group of industries is estimated to have added in 1925 from $135,000,000 to $150,000,000 to the total revenue of New England, and to have contributed about 5 per cent of the total revenue from all New England industries. The contribution of this group was approximately equal to that of all food manufactures, it having provided employment to some 25,000 wage earners, who are estimated to have been paid between $30,000,000 and $35,000,000 in wages.

Materials consumed by the chemical and drug industries in 1925 provided a market for various raw products, including fuel, power, and other supplies, estimated at not less than $150,000,000. The aggregate gross value of the output in 1925 is estimated to be between $275,000,000 and $300,000,000.

Accurate comparisons of the trend in this group of industries are difficult because of the incompleteness of census figures for various items in the individual States. The following table, however, affords broad comparisons of the different items in 1927 and 1925 for such data as are available. As the totals are generally more complete for 1925 than for 1927, the actual differences between the two years for all New England are not necessarily so great as appear from the incomplete figures presented in the table.

Chemical and Drug Industries in New England, 1925 and 1927

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Manufactured gas:						
1927	95	6, 897	10, 206	26, 614	64, 348	37, 734
1925	101	6, 882	10, 282	22, 025	59, 017	36, 992
Soap:						
1927	29	1, 092	1, 483	15, 115	34, 483	19, 367
1925	38	1, 244	1, 574	13, 354	30, 387	17, 033
Prepared medicines, etc.:						
1927	72	1, 195	1, 260	7, 238	22, 241	15, 003
1925	91	1, 454	1, 477	8, 828	25, 726	16, 899
Ammunition:						
1925	3	4, 292	4, 618	11, 105	21, 018	9, 912
Petroleum refining:						
1927	3	1, 077	1, 615	32, 185	40, 291	8, 106
1925	3	947	1, 537	30, 860	36, 003	5, 143
Paints and varnish:						
1927	50	928	1, 246	8, 985	16, 860	7, 874
1925	44	735	933	7, 408	12, 562	5, 154

CHEMICAL AND DRUG INDUSTRIES IN NEW ENGLAND, 1925 AND 1927—Continued

Item and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Chemicals, n. e. c.:						
1927	22	1, 898	2, 425	7, 574	14, 633	7, 059
1925	38	2, 912	3, 950	7, 496	17, 357	9, 861
Fertilizer:						
1927	22	661	709	5, 236	8, 520	3, 284
1925	16	460	479	3, 975	6, 900	2, 925
Glue and gelatin:						
1927	12	775	1, 043	4, 243	6, 831	2, 588
1925	12	718	948	2, 197	5, 031	2, 833
Blacking, stains, and dressings:						
1927	62	429	558	2, 310	5, 272	2, 963
1925	59	440	528	2, 401	4, 917	2, 516
Grease and tallow, not including lubricating grease:						
1927	18	669	869	3, 735	5, 765	2, 029
1925	20	748	320	3, 874	6, 376	2, 502
Tanning materials and dyestuffs:						
1927	36	283	422	3, 834	5, 607	1, 773
1925	37	373	380	4, 048	5, 754	1, 706
Perfume and cosmetics:						
1927	20	108	103	504	1, 534	1, 030
1925	21	278	238	2, 145	6, 788	4, 643
Oils, n. e. c.:						
1927	12	78	110	1, 831	2, 621	789
1925	13	117	152	2, 379	3, 341	962
Ink, printing:						
1925	5	92	139	729	1, 681	952
Druggists' preparations:						
1927	22	123	131	621	1, 295	674
1925	29	210	225	1, 366	2, 282	916
Fireworks:						
1925	5	365	403	357	1, 177	820
Mucilage, paste, and other adhesives:						
1927	9	105	122	1, 674	1, 239	565
1925	20	148	190	1, 629	2, 756	1, 127
Cleaning and polishing preparations:						
1927	24	74	84	397	1, 002	605
1925	31	281	333	1, 764	5, 239	3, 476
Total:						
1927	508	16, 392	22, 386	123, 096	232, 542	111, 443
1925	586	22, 696	28, 706	128, 940	255, 312	125, 372

As a source of manufacturing income, as well as in the employment of wage earners, gas manufacture overshadows any other activity of this group, with a product having a gross value in 1927 of upward of $64,000,000 and contributing to the revenue of New England some $37,700,000, as shown by value added by manufacturing. The making of soap also is important, its products exceeding $34,000,000 in value and adding more than $19,000,000 to the manufacturing revenue of the region. Prepared medicines and compounds are nearly as important as soap manufacture.

The making of various other chemical products, mainly for industrial uses, comprised an output of $14,600,000 and contributed upward of $7,000,000 to the manufacturing revenue by the processes of manufacture. The making of paints and varnishes is of considerable importance, with an output approaching $17,000,000 in value and with a net contribution not far from $8,000,000. Petroleum refining in Massachusetts alone contributed a similar amount; this phase of the industry is important also in Rhode Island. The miscellaneous group includes cleaning and polishing preparations, fertilizers, glue and gelatin, dyestuffs and tanning materials, inks and stains, fireworks, and kindred products.

GAS MANUFACTURE

The manufacture of illuminating and heating gas follows closely the distribution of population in different parts of New England. In 1927 there were 95 plants in the six States—a reduction from 101 in 1925—which gave employment to some 6,900 wage earners and paid upward of $10,000,000 in wages. There was an increase from 1914 of 25 per cent in the number of wage earners employed and of 137 per cent in the total value of products, accompanied by a reduction of 39 in number of plants. This industry provided a market for materials—amounting to upward of $26,000,000—in which fuel is a large item, and contributed $37,700,000 to the manufacturing revenue of the region. The total output of these gas companies in 1927 had an approximate value of $64,350,000, representing 13 per cent of the total value of manufactured gas for the whole United States. The importance in the different States of New England for 1925 and 1927, with comparative totals for 1914 and 1904, is shown in the following table.

MANUFACTURE OF ILLUMINATING AND HEATING GAS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	41	4, 079	6, 047	16, 202	38, 658	22, 456
1925	45	4, 229	6, 206	13, 888	36, 659	22, 771
Connecticut:						
1927	20	1, 447	2, 262	5, 184	13, 320	8, 135
1925	20	1, 330	2, 069	4, 124	11, 504	7, 380
Rhode Island:						
1927	4	766	1, 089	3, 204	7, 512	4, 308
1925	4	771	1, 192	2, 336	6, 478	4, 142
New Hampshire:						
1927	11	280	350	907	2, 113	1, 206
1925	11	245	337	819	1, 947	1, 128
Maine:						
1927	10	234	330	773	1, 875	1, 102
1925	11	214	347	591	1, 620	1, 028
Vermont:						
1927	9	91	128	343	870	527
1925	9	93	130	266	809	543
Total:						
1927	95	6, 897	10, 206	26, 614	64, 348	37, 734
1925	101	6, 882	10, 282	22, 025	59, 017	36, 992
1914	134	5, 519	3, 778	9, 044	24, 907	15, 863
1904	130	3, 220	1, 873	4, 760	13, 232	8, 472

The industry covers establishments, both private and municipal, which are engaged primarily in the commercial manufacture of gas delivered through mains for illuminating, household, or industrial purposes. In addition to its primary product, the by-products of the industry—coke, tar, and ammonia—are of substantial importance for use in other industries of New England.

This is a fairly stable industry, with a local consuming market which varies little from year to year. The trend of sales indicated in replies by reporting companies showed an average aggregate increase of 2 per cent a year since 1921, except for a similar decline in 1924.

Additions to plant capacity since 1921 were indicated by two-fifths of the number reporting. The actual 1925 output of reporting companies, representing nearly one-half of the total New England employment, averaged 54 per cent of their stated maximum capacity. The cost of advertising, as reported, averaged 1.9 per cent of total sales, and other selling costs amounted to 18.3 per cent.

SOAP MANUFACTURE

The manufacture of soap centers chiefly in Massachusetts, although the industry has some importance also in Connecticut and slight activity in Rhode Island. In Massachusetts there were 23 establishments in 1927 with an output having gross value of approximately $33,500,000. This industry added $19,000,000 to the State's manufacturing revenue, employing more than 1,000 wage earners and paying some $1,400,000 in wages. In comparison with 1925 a slight increase in employment is noted, also a substantial increase in value of output and in manufacturing revenue. No data for Connecticut are at hand for 1927, but in 1925 there were five establishments with an aggregate output approaching $4,000,000 in value. In Rhode Island soap manufacture shows some reduction since 1925. These three States contributed about 11 per cent of the total national soap output in 1925.

MANUFACTURE OF SOAP IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	23	1, 027	1, 396	14, 437	33, 497	19, 060
1925	24	981	1, 235	10, 884	25, 007	14, 123
Connecticut:						
1925	5	187	237	1, 527	3, 885	3, 258
Rhode Island:						
1927	6	65	88	678	986	308
1925	9	76	102	943	1, 495	552
Massachusetts and Rhode Island total:						
1927	29	1, 092	1, 483	15, 115	34, 483	19, 367
Massachusetts, Connecticut, and Rhode Island:						
1925	38	1, 244	1, 574	13, 354	30, 387	17, 933
1914	44	627	346	3, 405	6, 210	2, 805
1904 [1]	68	859	----------	----------	----------	----------

[1] Not including Vermont, 2.

This industry shows a remarkable growth in New England in the last decade. The number of wage earners in 1925 was approximately twice that in 1914, and the value of the output was nearly five times that of 1914. Massachusetts produces about half as much soap as New Jersey, and is surpassed also by Ohio and New York; but in value added by manufacture Massachusetts is exceeded only by New Jersey.

One of the leading soap-manufacturing establishments of the United States is located in Cambridge, Mass., and this plant contributes a large portion of the New England production. A characteristic of this industry is its concentration in large establishments. Most of the New England establishments, however, are small companies that consume local materials and supply local markets. The principal raw materials are grease and tallow, which are purchased locally as by-products of other industries, and oils and alkalies.

Reports from representative companies, comprising 40 per cent of all the New England wage earners in the soap industry, show that all of those reporting from Massachusetts except one concern made 80 per cent or more of their sales within New England, while the Connecticut companies made the majority of their sales outside. One-third of the companies reported exports which, exclusive of shipments to Canada, ranged from 1 to 11 per cent of their total sales.

The large companies have national distribution of their product. Main distribution channels were reported to be direct to the consumer or through wholesale dealers. Textile soaps are usually sold direct to consuming manufacturers, while other soaps are sold mainly to wholesalers and to some extent direct to retailers. Advertising is largely through local mediums. The average advertising expense, as stated by reporting companies, was 13.5 per cent of their aggregate sales, and their selling cost, exclusive of advertising, was 15.4 per cent. The sales trend of reporting companies showed for the aggregate a steady increase in the last few years, their total in 1925 being 26 per cent greater than that of 1921.

MEDICINAL AND TOILET PREPARATIONS

This group of industries includes products which are retailed principally through drug stores and embraces three closely related lines of manufacture, including (1) druggists' preparations, (2) prepared medicines and compounds, and (3) toilet preparations, such as perfumes, cosmetics, shaving creams, and tooth pastes. The importance of these industries as a source of income to the region is enhanced by the fact that the value added in the manufacturing processes comprises nearly two-thirds of the gross value of products.

These industries consist, for the most part, of old established concerns which started in New England in the home of their originators. One of the largest enterprises of its kind in the whole country, however, is of comparatively recent origin. Some of the concerns have branch outlets widely distributed throughout the United States and Canada, as well as in South America and Europe.

MANUFACTURE IN INDIVIDUAL STATES

The products of these industries of New England had in 1925 a total value of $36,898,000, contributed by 164 establishments, and represented 7.3 per cent of the national total in this line of manufacture. Approximately 60 per cent of this activity was centered in Massachusetts, and 30 per cent in Connecticut, while the rest was distributed among the other four States.

A striking growth is shown in the manufacture of proprietary compounds and prepared medicines since 1914, from a value of less than $1,000,000 to more than $25,000,000. There was an increase in value added in 11 years from less than $700,000 to nearly $17,000,000 and a doubling in number of wage earners employed. In the manufacture of toilet preparations there was a decrease in the number of wage earners, accompanied by a doubling in the value of the product, while the value added by manufacture in 1925 was four times that in 1914. In druggists' preparations there was a reduction in the number of wage earners, but a moderate increase occurred in output and in value added by manufacture. Since 1925 the activity in these lines appears to have been generally sustained, according to census figures, as shown in the tables.

MANUFACTURE OF PREPARED MEDICINES AND COMPOUNDS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	54	1,017	1,102	6,477	20,189	13,713
1925	53	1,048	1,095	6,956	19,529	12,574
Connecticut:						
1925	11	188	182	994	3,828	2,835
Vermont:						
1927	9	132	110	616	1,597	981
1925	10	134	117	625	1,519	894
Maine:						
1927	9	46	49	145	454	309
1925	8	56	56	153	498	345
Rhode Island:						
1925	5	21	18	78	298	220
New Hampshire:						
1925	4	7	10	23	54	31
Total:						
1927	72	1,195	1,260	7,238	22,241	15,003
1925	91	1,454	1,477	8,828	25,728	16,899
1914 [1]	31	609	353	262	954	692
1904	20	198	81	370	1,398	1,028

[1] Not including Maine, 2; New Hampshire, 2.

MANUFACTURE OF PERFUMERY, COSMETICS, AND TOILET PREPARATIONS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	20	108	103	504	1,534	1,030
1925	18	98	88	418	1,260	841
Connecticut:						
1925	6	180	150	1,726	5,528	3,801
Total:						
1925 [1]	24	278	238	2,145	6,783	4,643
1914	40	340	131	1,185	3,305	1,120
1904 [2]	26	60	27	575	800	225

[1] Not including Maine, 1; Rhode Island, 1.
[2] Not including Maine, 1; Vermont, 1.

RAW MATERIALS

The principal raw materials are chemicals, crude drugs, alcohol, and essential oils, which are said to be purchased, for the most part, outside New England. An important part of the product is likewise marketed outside New England. Replies from a representative number of concerns gave an unweighted average of 51 per cent as the portion sold within New England.

SALES TRENDS AND DISTRIBUTION

General increases in sales were reported by two-thirds of these concerns, which were credited to extension of territories, the addition of new lines, and new sales methods. Some companies reported decreased sales, particularly of veterinary remedies, which were attributed to the declining use of horses. Decreased sales of prepared medicines were also reported in several instances, and were attributed to improvement in general health and to changes in popular attitude.

The distribution of products was stated by almost every reporting manufacturer to be either through wholesale houses or direct to the retailer, both methods being often employed. Practically all the product is marketed under a brand or trade-mark. The use of advertising mediums was indicated in three-fourths of the replies, in which national distribution by direct mail was the most common practice, supplemented by other mediums.

INDUSTRIAL CHEMICALS

In the manufacture of chemicals for industrial uses New England holds a minor place, contributing less than 4 per cent of the national total; yet this activity in 1925 added some $10,000,000 to the manufacturing income of the region. In that year there were in New England 45 establishments which gave employment to some 3,000 wage earners, who received upward of $4,000,000 in wages and made a product with a gross value considerably in excess of $17,000,000. A considerable falling off is noticed in 1927. Statistics for Massachusetts and Rhode Island are presented in the following table.

MANUFACTURE OF MISCELLANEOUS CHEMICAL COMPOUNDS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	15	1,580	2,040	6,581	12,920	6,339
1925	31	2,664	3,598	6,585	15,716	9,131
Rhode Island:						
1927	7	318	385	993	1,713	720
1925	7	248	352	911	1,640	729
Total:						
1927	22	1,898	2,425	7,574	14,633	7,059
1925[1]	38	2,912	3,950	7,496	17,357	9,861

[1] Excluding Connecticut, 4; Maine, 1; New Hampshire, 2.

With a few exceptions manufacture is for the New England market. The average proportion of New England sales by a representative group of reporting manufacturers was 87 per cent of their total business. With the exception of chemicals for use in the textile industries, these companies showed a general increase in their New England sales in the past few years. Distribution is generally either direct to the manufacturing consumers or through wholesale houses. The raw materials used by chemical manufacturers comprise a considerable variety of items, whose sources are principally outside New England. A number of companies reported improvements in manufacturing practice along the line of industrial research.

CLEANING AND POLISHING PREPARATIONS

The manufacture of cleaning and polishing preparations for use on metals and wood, and of blackings, stains, and dressings, contributed in 1925 some $6,000,000 to the manufacturing income of New England, with a product having a gross value of upward of $10,000,000. Connecticut is the leading State in this line, particularly in silver and other metal polishes, its seven establishments in 1925 adding nearly $3,000,000 to the manufacturing revenue of the State. No figures for this State are available for 1927.

Outside Connecticut the establishments are mainly small concerns with a few wage earners each. In Massachusetts there were 59 concerns making blacking, stains, and dressings, with an output valued at $4,916,000 in 1925, which contributed $2,500,000 to the manufacturing revenue of the State. The activity increased to 62 establishments in 1927, with an increase in product to $5,270,000 and a net revenue amounting to $9,962,000.

RAW MATERIALS

As raw materials most of the manufacturers reporting in this group purchase oils and waxes. In the majority of cases oils were said to be purchased within New England, while waxes were reported to be obtained from New York and from foreign countries. There is a great variety of other purchased materials.

SALES TRENDS AND DISTRIBUTION

The general trend of sales in this line in the last few years has been downward. In the case of shoe dressings, this is attributed largely to changes in shoe styles, particularly for women. One manufacturer stated that 66 per cent of the business in shoe polish was formerly for women's shoes, and that the reduction in the amount of leather now used has greatly curtailed the market for this type of polish, although that for men's shoes has continued good. The few plants whose sales have increased during the last few years credited their advance to the adoption of new sales methods and the addition of new products. The average proportion of New England sales by reporting companies was 59 per cent of total sales. One concern stated that it was centering its sales on the Middle West, because it found there a much better market than in New England.

Various methods of distribution are indicated by manufacturers. The largest number sell direct to manufacturers of shoes or of silverware, or to large consumers of floor oil, but nearly as many concerns report selling through wholesalers or jobbers. The majority reported national advertising, in which the chief mediums are direct-mail and trade journals. The practice in regard to the use of brands and trade-marks is far from uniform, but the majority indicated that they brand the most of their product.

PAINT AND VARNISH

The manufacture of paints, pigments, fillers, varnishes, and lacquers was represented in 1927 by 40 establishments in Massachusetts and 10 in Connecticut, whose products had a gross value approaching $17,000,000, which added nearly $8,000,000 to the manufacturing revenue of the two States. There are plants also in Rhode Island and Vermont, for which no figures are available. Although the contribution of these activities is relatively unimportant in the national total, it has considerable significance to this region because of the large consumption of products of this nature within New England, where it is the general practice to keep buildings well and frequently painted. A healthy increase since 1925 in the New England production is indicated by the census figures for these two States, presented in the following table.

Manufacture of Paints and Varnishes in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	40	666	873	6, 960	12, 920	5, 895
1925	35	631	802	6, 582	11, 350	4, 768
Connecticut:						
1927	10	262	373	1, 960	3, 940	1, 979
1925	9	104	131	827	1, 213	386
Total:						
1927	50	928	1, 246	8, 985	16, 860	7, 874
1925	44	735	933	7, 408	12, 562	5, 154
1914	38	499	268	2, 712	5, 091	2, 379
1904	47	521	278	2, 108	3, 336	1, 228

This is an industry of long standing in New England. The average period of operation indicated by special replies from representative establishments was 33 years, and there were several which had been in business from 60 to 80 years. The principal materials—oil, leads, and pigments—are purchased outside New England. The trend of sales was upward and had been fairly regular since 1921 for a majority of these concerns. The average proportion of sales made within New England, as indicated by reporting companies, was 76 per cent of the total business. By a number of concerns growth in New England business was attributed to increased sales emphasis on the New England market. Others credited this growth to a national increase in demand, accompanying the building activity of the last few years. Some manufacturers reported a falling off in sales, which they attributed to local industrial conditions. Distribution outlets are almost evenly divided among retailers, industrial consumers, and wholesalers. Local advertising was indicated by about one-half of the replies, and national advertising by one-third.

PETROLEUM REFINING

There were 3 petroleum refineries in Massachusetts and 2 in Rhode Island in 1927. The Massachusetts refineries employed upward of 1,000 wage earners and contributed upward of $8,000,000 to the manufacturing revenue of the State, with a product valued at more than $40,000,000. No separate data of production are available for Rhode Island. The raw material consists principally of crude petroleum, which is brought to the refineries in vessels by tidewater. The principal refined product is gasoline, which is distributed from the refineries throughout the New England market by tank cars and trucks to local distributors. A substantial increase in the activity of the refineries of Massachusetts is observed from 1925 to 1927.

OTHER CHEMICAL INDUSTRIES

AMMUNITION AND EXPLOSIVES

Of a number of other industries in the general chemical group which are of considerable aggregate importance in New England the most prominent is the manufacture of ammunition and explosives, which in 1925 was represented by 3 establishments in Connecticut, whose output in that year exceeded $21,000,000 and contributed nearly $10,000,000 to the manufacturing revenue of that State. In 1925 there were also 2 establishments in Massachusetts making ammunition and 1 making explosives, for which there are no figures of production. This industry thus added considerably more than $10,000,000 in 1925 to the manufacturing revenue of New England. Besides this, there were eight establishments making fireworks, which added $1,000,000. Five of these were in Massachusetts, 2 in Connecticut, and 1 in Maine. There are no separate statistics for 1914, but in 1904 there were five Connecticut establishments making ammunition, with a product valued at $15,394,000, adding to the manufacturing revenue of the State $7,591,000 in that year.

GLUE, GELATIN, AND MUCILAGE

The making of glue, gelatin, mucilage, and other adhesives in New England was represented in 1925 by 36 establishments and a product of approximately $9,000,000, making a net addition to the manufacturing income exceeding $4,000,000. Thirty-two of these concerns were located in Massachusetts, 2 in Connecticut, and 1 each in Maine and New Hampshire. This industry is an important and profitable outlet for the by-products of fish and meat packing. Glue and gelatin produced in Massachusetts had a value in 1927 of $6,831,000; in 1925, of $6,030,000; in 1914, of $2,589,000; and in 1904, of $1,463,000.

GREASE AND TALLOW

The rendering of grease and tallow from fat, bones, and meat scraps is an important by-product activity connected with the processing of hides and skins and other materials. In 1925 there were 31 New England establishments in this line, with an output estimated at upward of $8,000,000. Twenty of these were in Massachusetts, 3 each in Connecticut and New Hampshire, 2 each in Rhode Island and Vermont, and 1 in Maine. The whole New England output was approximately equal to that of New York State, which in turn was surpassed by Illinois. These figures are exclusive of the by-products of slaughtering and meat-packing establishments. The value of grease and tallow produced in Massachusetts in 1927 was $5,765,000; in 1925, $6,376,000; in 1914, $2,668,000; and in 1904, $3,022,000.

FERTILIZERS

The making of fertilizers from the waste of fish-packing establishments and from slaughtering and packing plants was reported in 1927 by 22 concerns with an output valued at $8,520,000, which represented about 3.5 per cent of the national production. In Massachusetts and Connecticut there were 7 establishments each, and 8 in Maine, an increase of 6 plants in these three States as compared with 1925. Considerable increase is noted in total activity, as is shown in the following table.

MANUFACTURE OF FERTILIZERS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	7	429	451	2,863	5,041	2,178
1925	5	242	242	1,587	3,114	1,527
Connecticut:						
1927	7	161	191	1,639	2,408	769
1925	6	169	191	1,933	3,024	1,091
Maine:						
1927	8	71	67	734	1,071	337
1925	5	49	47	455	762	307
Total:						
1927	22	661	709	5,236	8,520	3,284
1925	16	460	479	3,975	6,900	2,925

TANNING MATERIALS AND DYESTUFFS

In the manufacture of tanning materials and dyestuffs there were 36 establishments in 1927 in Massachusetts and Rhode Island whose output had a gross value of $5,600,000, compared with a production in 1925 of $5,700,000, in 1914 of $2,500,000, and in 1904 of $1,500,000. There were 26 establishments in Massachusetts, 11 in Rhode Island, and 2 in Connecticut, the total of 39 having increased from 25 in 1914. Massachusetts and Rhode Island together contributed about one-sixth of the national production. Massachusetts is surpassed nationally only by New Jersey. These figures do not include the making of synthetic dyes, which are included in the group of industrial chemicals.

ANIMAL AND VEGETABLE OILS

The manufacture of animal and vegetable oils was represented in 1927 by 12 establishments in Massachusetts, with a product valued at $2,621,000, in addition to 3 concerns in Rhode Island, for which there are no production figures.

INK

In the manufacture of writing ink Massachusetts stands out as one of the two leading States of the country, sharing first place with Illinois. One of the leading ink companies of the country, located in Cambridge, Mass., has a world-wide distribution of its product. The product of the two Massachusetts establishments surpassed in 1925 that of New York State. In the manufacture of printing ink there were six New England establishments in 1925 with an aggregate output of about $1,700,000. In comparison with other sections New England is relatively unimportant in this product. Figures of New England production of writing and printing ink are not available for 1927.

MISCELLANEOUS MANUFACTURES

MUSICAL INSTRUMENTS

In the manufacture of musical instruments New England still contributes a considerable portion of the national total, although it has lost much of its former importance. It is estimated that the making of musical instruments and parts in 1925 contributed in the neighborhood of $15,000,000 to the manufacturing revenue of New England. In that year there were 12 New England establishments making pianos, of which 10 were in Massachusetts and 2 in Connecticut; also 8 establishments making organs, of which 5 were in Massachusetts, 2 in Connecticut, and 1 in Vermont. Besides these there were 36 concerns engaged in the production of various materials and parts for musical instruments, of which 28 were in Massachusetts and 8 in Connecticut.

The manufacture of instruments and parts in Massachusetts occupied all together the activities of 43 establishments in 1925, which gave employment to 3,389 wage earners, with an output valued at upward of $15,000,000, and a contribution to the manufacturing revenue of the State exceeding $9,000,000. In Connecticut there were, in all, 12 establishments in these lines. No production figures are available for the 4 concerns manufacturing organs and pianos, but 6 concerns making piano and organ materials gave employment to 1,116 wage earners, making a product valued at nearly $4,700,000 and adding to the State's manufacturing revenue upward of $2,500,000.

These figures are exclusive of the making of phonographs, in which there were 9 establishments in Massachusetts and Connecticut in 1925, which employed 1,246 wage earners, making products valued at $7,443,000 and adding $5,000,000 to the manufacturing revenue of these two States. Eighty-five per cent of this activity was contributed by 5 concerns in Connecticut.

In piano manufacture a substantial growth in activity is shown since 1925 in the 10 Massachusetts establishments, with increases in number of wage earners and in gross value of output. The net revenue to the State in 1927 exceeded that of 1925 by upward of $1,000,000. There was considerable falling off, however, in the activities of plants making materials and parts for pianos and organs, both in Massachusetts and Connecticut. In comparison with 1914 there has been a material reduction in the importance of these activities to New England. In the manufacture of phonographs some change is noted since 1925 in Massachusetts. In the lack of 1927 production figures for Connecticut no statement is attempted regarding changes in that State since 1925.

The output in 1914 of pianos, organs, and other musical instruments and materials in Connecticut and Massachusetts was represented by 71 establishments. The plants in these two States gave employment to 6,173 wage earners and turned out products valued at $13,443,000, contributing $7,170,000 to the manufacturing revenue of the two States. In that year there were 52 establishments in Massachusetts and 19 in Connecticut, in addition to 5 in Vermont, 2 each in Maine and New Hampshire, and 1 in Rhode Island.

The following summary table of available production figures for musical instruments and phonographs in 1927, 1925, and 1914 shows the general New England situation in these lines.

MANUFACTURE OF MUSICAL INSTRUMENTS IN NEW ENGLAND, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Pianos:						
Massachusetts—						
1927	10	1,648	2,418	3,657	8,645	4,989
1925	10	1,326	2,046	2,700	6,614	3,914
Piano and organ materials:						
Connecticut—						
1927	7	1,062	1,090	1,801	3,918	2,117
1925	6	1,166	1,140	2,113	4,689	2,576
Massachusetts—						
1927	13	667	855	870	2,246	1,376
1925	16	1,114	1,322	1,734	4,149	2,415
Total:						
1927	20	1,729	1,945	2,671	6,164	3,493
1925	22	2,280	2,462	3,846	8,837	4,991
Organs and orchestrions:						
Massachusetts—						
1927	5	284	535	448	1,642	1,195
1925	5	276	532	416	1,529	1,113
Other instruments and materials:						
Massachusetts—						
1927	8	229	308	221	788	567
1925 [1]	12	301	363	366	1,103	747
Phonographs:						
Massachusetts—						
1927	3	250	294	309	1,257	948
1925	4	291	318	601	1,286	685
Connecticut—						
1925	5	955	1,159	1,838	5,156	4,318
Total:						
1925	9	1,246	1,476	2,439	7,443	5,003
Musical instruments, pianos, organs, and materials, 1914:						
Massachusetts	52	3,906	2,510	----------	8,213	4,511
Connecticut	19	2,267	1,277	----------	5,230	2,659
Total [2]	71	6,173	3,786	6,273	13,443	7,171

[1] Not including Connecticut, 2 establishments.
[2] Not including Maine, 2; New Hampshire, 2; Rhode Island, 1; Vermont, 5.

Replies from a representative number of manufacturers of musical instruments regarding production and sales in recent years indicated a general upward trend from 1921 to 1925, with the exception of phonographs, for which the trend was decidedly downward. Increasing sales of pipe organs were attributed by some concerns to the increased popularity of the organ for motion-picture houses and radio concerts, and to the replacement of many old organs with modern instruments. On the the other hand, a manufacturer of piano actions made the statement that western competition has driven the piano manufacturers out of New England.

Distribution of musical instruments, as indicated by reporting companies, was said to be mainly direct to churches and theaters or to retail music dealers, and, in some cases, through the companies' own stores and agents. Materials for instruments were reported to be sold generally direct to the instrument manufacturers. The reports indicated that advertising was almost wholly national in character, mainly through the medium of trade journals, supplemented by magazines and direct mail. The average advertising expense of these reporting concerns was 5.7 per cent of their aggregate sales, and other selling expenses were 4.7 per cent.

SPORTING AND ATHLETIC GOODS

The making of fishing rods and tackle, equipment for baseball, football, basket ball, tennis, golf, and polo, in addition to snow shoes, toboggans, and other equipment for winter sports, exercising machines, and other athletic and sporting goods, assumes substantial importance in New England, with establishments reported in 1925 in each State. There were 33 concerns making these goods in that year, of which 16 were in Massachusetts, 4 each in Maine, Connecticut, Rhode Island, and Vermont, and 1 in New Hampshire. This industry in Massachusetts gave employment in 1925 to 1,887 workers, with a product exceeding in value $10,750,000, and added more than $6,000,000 to the manufacturing revenue of the State. Massachusetts contributed one-fourth of the value of the national production in this line. Of the 17 establishments in the other States production figures are available only for 4 in Maine. It is conservatively estimated that the total production of all manufactures of sporting and athletic goods in New England in 1925 exceeded considerably $15,000,000 in value, and that it added from $9,000,000 to $10,000,000 to the manufacturing revenue of New England.

MANUFACTURE OF SPORTING AND ATHLETIC GOODS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	15	1,962	2,698	3,968	8,189	4,220
1925	16	1,887	2,555	4,689	10,763	6,074
Maine:						
1927	4	78	78	108	236	128
1925	4	62	55	89	189	100
Total:						
1927	19	2,040	2,776	4,076	8,425	4,349
1925 [1]	20	1,949	2,610	4,798	10,952	6,174
1914 [2]	24	1,304	781	2,005	3,477	1,472

[1] Not including Connecticut, 4; New Hampshire, 1; Rhode Island, 4; Vermont, 4.
[2] Not including Connecticut, 3; New Hampshire, 2; Rhode Island, 2; Vermont, 2.

Available figures for 1927 for Massachusetts show some increase in number of wage earners, but a falling off both in gross value of output and in net revenue, presumably in consequence of a lower level of prices. This New England industry has shown substantial growth in the last few years, both actually and in relation to the country as a whole. The combined sales reported by representative manufacturers showed a decidedly upward trend from 1921. Employment for the industry as a whole appeared to be fairly uniform, with little seasonal variation, in consequence of the wide variety of articles made by different establishments.

Most of the reporting companies have their principal market outside New England, the proportion of sales in the section averaging one-third of the total reported output. Some export business was indicated by individual concerns, ranging from 1 to 45 per cent of total business. It appears to be the general practice to use brands or trade-marks on the product. Advertising was usually reported as national in character, mainly through the medium of trade journals, supplemented by other mediums. Most of the companies reported sale of their output through wholesalers or jobbers. Some, however, reported direct sales to retailers or to the consumer, and a few through exclusive distributors.

TOYS AND GAMES

There were in 1925 nearly twice as many establishments making toys and games in New England as those making sporting and athletic goods and their aggregate importance was nearly as great, with a total employment of about 3,400 workers and an output approaching $12,000,000 in gross value, which added to the manufacturing revenue about $7,400,000. This industry is well represented in each of the States.

Manufacture of Toys and Games in New England States, 1925 and 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	27	1, 761	1, 740	2, 924	7, 718	4, 794
1925	26	1, 525	1, 384	2, 390	5, 929	3, 738
Connecticut:						
1927	14	957	972	1, 294	3, 825	2, 531
1925	17	903	887	1, 203	3, 640	2, 438
Maine:						
1927	4	344	299	384	1, 090	707
1925	4	428	377	550	1, 217	667
Vermont:						
1927	5	314	329	228	692	464
1925	4	362	278	206	648	442
New Hampshire:						
1927	6	163	148	178	568	390
1925	7	157	154	166	455	289
Total:						
1927	56	3, 539	3, 489	5, 007	13, 893	8, 886
1925 [1]	58	3, 375	3, 080	4, 515	11, 889	7, 374
1914 [2]	47	2, 212	989	1, 639	3, 932	2, 298

[1] Not including Rhode Island, 2.

[2] Not including Maine, 1.

In 1927 there were 27 concerns in Massachusetts, 14 in Connecticut, 6 in New Hampshire, 4 in Maine, and 5 in Vermont; Rhode Island was not reported. Activity in 1927 was considerably greater than in 1925, and each of the States except Maine shared in the increase. A very substantial growth is evident in the past decade. The number of workers engaged in this line in 1925 was one-half greater than in 1914, while the value of the output was three times that of 1914 and the manufacturing revenue was more than three times as great.

EMERY WHEELS AND OTHER ABRASIVES

In the manufacture of emery wheels and general abrasive materials Massachusetts produces more than 60 per cent of the total reported national output. There were 14 establishments in that State in 1927, which gave employment to 1,753 workers, making a product exceeding $15,000,000 in value and adding more than $9,000,000 to the manufacturing revenue of the State. There were also 4 establishments in Connecticut and 1 in Rhode Island.

This industry has made remarkable growth in New England since 1914. There were in the earlier year the same number of establishments in Massachusetts as in 1925 but only half as many wage earners, with an output of only $2,300,000, representing less than one-sixth of the 1925 value and less than one-sixth of the manufacturing revenue. Census figures for 1927, in comparison with those for 1925, show some reduction in activity. (See table, p. 573.)

Replies received from 10 concerns making abrasive materials, representing most of the New England employment, showed that the combined sales trend of these companies from 1921 to 1925 was generally upward. The majority of sales were reported to be made outside New England; the proportion made in this section averaged 34 per cent of total business. Distribution was said to be mainly direct to industrial manufacturers, with other outlets as secondary channels.

OPTICAL GOODS

In the manufacture of spectacles, eyeglasses, lenses, and their frames and mountings, Massachusetts contributed approximately one-third of the national production in 1925, with 19 establishments engaged in this line, employing 2,569 wage earners, which made products exceeding $10,750,000 in value and added to the manufacturing revenue of the State upward of $7,000,000. The 1914 output of optical goods in Massachusetts was represented by 13 concerns, whose aggregate employment was 200 workers less than the State total for 1925, and the aggregate output was 37 per cent of the value in the later year. In 1925 there were 4 similar establishments reported for Rhode Island, with a product valued at $622,000, and 1 in Connecticut, for which there are no production figures. Census figures for 1927 are available only for 5 establishments in Rhode Island, whose activity shows a healthy increase over that of 1925. (See table, p. 573.)

One of the leading companies of the United States in this line has an extensive plant at Southbridge, Mass., from which it makes national distribution of its product. Several of the larger manufacturers in this line market their output throughout the United States, and the greater proportion of the goods made by the industry is sold outside New England. The principal distribution is reported to be made through wholesale dealers, or direct to the retail trade.

PROFESSIONAL AND SCIENTIFIC INSTRUMENTS

In 1925 there were 28 New England concerns making professional and scientific instruments, of which 21 were in Massachusetts, 4 in Connecticut, and 3 in Rhode Island. In Massachusetts this industry paid upward of $500,000 in wages, making a product exceeding $2,500,000 in value and contributing nearly $2,000,000 to the manufacturing revenue of the State. In this State there was a falling off in the number of workers as compared with 1914, accompanied by a doubling in value of the output, while the manufacturing revenue in 1925 was between two and three times that of 1914. Substantial increase in activity is indicated for 1927, in comparison with 1925. (See table, p. 573.)

BRUSHES

In the manufacture of brushes there were 40 establishments in Massachusetts, Connecticut, and Rhode Island in 1925, which produced 25 per cent of the value of the national output in this line, giving employment to 1,941 workers, making a product approaching $11,500,000 in value and adding more than $7,000,000 to the manufacturing revenue of these three States. The value of the production of 8 establishments in Connecticut was not far from half that of 25 concerns in Massachusetts, but Connecticut had less than one-third as many wage earners. There were 7 small establishments in Rhode Island which contributed a minor portion. In addition to these, 2 establishments each were reported in Maine and Vermont and 3 in New Hampshire, without production figures.

Compared with 1914, this industry in three New England States showed in 1925 a reduction in number of establishments from 58 to 47, an increase of about 300 wage earners and an increase of 165 per cent in value of product. The manufacturing revenue in 1925 was between three and four times that of 1914. Census figures for 1927 show that in Massachusetts there was some reduction in wage earners and in net revenue in comparison with 1925, although there was a slight increase in gross value of product.

Replies regarding production and marketing conditions in the past few years were received from manufacturers representing practically the entire brush industry in New England. The average reported output in 1925 was 72 per cent of maximum capacity. Employment was fairly uniform throughout the year, and a high proportion of workers was reported to be on an incentive basis of wage payment. Combined sales of these companies showed substantial increases in 1922 and 1923, but a decline in 1924 and 1925. The reason most frequently given by concerns whose sales had been declining was competition with other sections; while those having increased sales attributed the increase generally to reduction in manufacturing costs and to extension of selling territories.

MANUFACTURE OF BRUSHES OTHER THAN RUBBER IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	23	1,228	1,335	3,095	7,652	4,557
1925	25	1,451	1,445	2,715	7,598	4,883
Connecticut:						
1925	8	429	426	1,562	3,676	2,113
Rhode Island:						
1927	6	52	55	76	193	118
1925	7	61	55	85	213	128
Total:						
2 States, 1927	29	1,280	1,390	3,170	7,845	4,675
3 States—						
1925 [1]	40	1,941	1,926	4,363	11,487	7,124
1914 [2]	50	1,663	816	2,452	4,347	1,895

[1] Not including Maine, 2; New Hampshire, 3; Vermont, 2.

[2] Not including Maine, 3; New Hampshire, 2; Vermont, 3.

The market in this industry is divided between New England and outside sections; the unweighted average of New England sales of reporting companies was 58 per cent of their individual business. Use of a company brand or trade-mark was indicated for approximately 72 per cent of the product. Replies did not indicate extensive advertising; less than one-third of them stated the employment of national mediums, and even a smaller proportion indicated local advertising. For the group the advertising costs in 1925 represented a little less than 3 per cent of their aggregate sales.

The channels of distribution, as indicated in the replies, were through wholesalers, direct to industrial consumers, direct to retailers, and through sales agents. One of the leading New England concerns has made an outstanding feature of direct distribution of its product to the individual user, through house-to-house sales by local representatives, in which it has met with unusual success.

FANCY AND NOVELTY ARTICLES

In the making of fancy articles which can not be classified in other industries, such as beadwork, novelties of celluloid, metal, paper, and wood, lamp shades and articles of similar nature, there were 82 establishments in Massachusetts, Rhode Island, Connecticut, and Maine in 1927, which employed upward of 4,000 workers, turning out a product exceeding $14,000,000 in value and adding about $7,850,000 to their manufacturing revenue. This shows a very substantial increase since 1925. The value of the product in 1925 was approximately three times that for these States in 1914, and the manufacturing revenue more than trebled in that 11-year interval.

MANUFACTURE OF FANCY AND NOVELTY ARTICLES IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	48	2, 346	2, 519	4, 280	9, 078	4, 798
1925	34	1, 218	1, 250	2, 136	4, 924	2, 788
Rhode Island:						
1927	20	1, 174	906	1, 456	3, 505	2, 049
1925	14	902	782	930	2, 382	1, 452
Connecticut:						
1927	11	508	521	677	1, 659	982
1925	11	180	180	339	802	463
Maine:						
1927	3	13	14	11	31	20
Total:						
4 States, 1927	82	4, 041	3, 960	6, 424	14, 273	7, 848
3 States—						
1925 [1]	59	2, 300	2, 212	3, 406	8, 108	4, 702
1914 [2]	48	1, 260	640	1, 264	2, 707	1, 442

[1] Not including Maine, 2; New Hampshire, 2.
[2] Not including Maine, 1; New Hampshire, 1; Rhode Island, 2; Vermont, 1.

HOUSE-FURNISHING GOODS

The manufacture of various house-furnishing articles that are not included in other classes of products is an activity of considerable importance in Massachusetts and Connecticut. This group of industries provided employment in 1927 to 2,285 wage earners in 75 establishments in these two States and Rhode Island, with products of a gross value of nearly $16,000,000, which contributed upward of $6,000,000 to their manufacturing revenue. Considerable increase in activity is noted since 1925, as shown by number of wage earners and by value added by manufacture, although there was considerable falling off in gross value of product in consequence of substantial reduction in cost of materials in the later year.

MANUFACTURE OF HOUSE-FURNISHING GOODS IN NEW ENGLAND STATES, 1925 AND 1927

State and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Massachusetts:						
1927	62	1, 422	1, 193	6, 443	10, 743	4, 300
1925	57	1, 396	1, 320	9, 581	13, 577	3, 966
Connecticut:						
1927	8	806	696	3, 018	4, 940	1, 922
1925	8	660	559	2, 621	3, 861	1, 241
Rhode Island:						
1927	5	57	43	137	222	84
1925	6	65	42	137	213	76
Total:						
1927	75	2, 285	1, 933	9, 599	15, 905	6, 306
1925 [1]	71	2, 121	1, 921	12, 339	17, 651	5, 311

[1] Not including Maine, 1; New Hampshire, 1; Rhode Island, 2; Vermont, 1.

ROOFING MATERIALS

In the manufacture of roofing materials other than those included in the wood, mineral, or paper industries, Massachusetts was represented in 1925 by six establishments, which employed 507 wage earners, making a product valued at $9,000,000 and contributing nearly $4,500,000 to the manufacturing revenue of that State. There was also one establishment in Connecticut for which there are no production figures. No separate census data for Massachusetts are available for 1927. (See table, p. 574.)

BUTTONS

The manufacture of buttons from pearl or shell, vegetable ivory, celluloid, horn, or metal, including cloth-covered and shoe buttons, was represented in 1925 by 28 New England establishments. This industry is of principal importance in Connecticut, where there were then 13 concerns, which added $1,750,000 to the manufacturing revenue of the State. In 1927 there were 10 establishments in this State which contributed approximately the same revenue. There were 11 establishments in Massachusetts in 1925 which added something more than $250,000 to the net income of that State. In these two States there were 1,027 wage earners, whose aggregate product had a value in 1925 of nearly $3,200,000 and contributed $2,000,000 to their manufacturing revenue. There were also 2 establishments in Rhode Island and 1 each in Maine and New Hampshire. In this industry there was a reduction of 500 workers from 1914 to 1925, accompanied by an increase of about $1,000,000 in the value of the product and of $700,000 in the contribution to the manufacturing revenue. (See table, p. 574.)

The combined sales trend of a group of representative button manufacturers showed a considerable drop in comparison with 1923. The output of reporting plants in 1925 averaged 68 per cent of capacity. The majority of these companies stated that sales to New England customers comprised only 5 to 10 per cent of their total output. The principal market is said to be in New York City. Distribution is mainly direct to manufacturers of clothing and other apparel, but most of the companies reported the sale of a portion of their output through jobbers and the usual other distribution agencies.

COMBS AND HAIRPINS

There were 19 establishments in Massachusetts making combs and hairpins in 1927, employing 960 workers, making a product valued at $2,938,000, and contributing $1,733,000 to the State's manufacturing revenue. Activity in this State was practically the same as in 1925, but there was a reduction of three establishments. The principal manufacturing center is Leominster, which is known as the "home of the comb industry." Massachusetts contributed two-thirds of the national product in 1925 and about the same proportion in 1914. In that State the industry showed a reduction of 1,000 employees as compared with 1914, accompanied by a falling off of 24 per cent in the value of the output and a slight increase in its contribution to the State's manufacturing revenue. (See table, p. 574.)

Replies from representative concerns show a sharp falling off in their aggregate sales from 1921 to 1925. All reporting companies showed decreased sales in that period, and all attributed the falling off to the same reason—the change in the style of hairdressing, especially the vogue of bobbed hair, which has greatly curtailed the use of hairpins and hair ornaments. The market was reported to be mainly outside New England, with a group average of 14 per cent of total sales made within these States. Small exports were indicated by half the reporting companies, generally not more than 1 per cent, although a few reported upward of 10 per cent. Sales were prevailingly made through wholesalers or jobbers, with some sales direct to the retailer. The situation confronting comb and hairpin manufacturers is not a distinct New England problem but is one of style, which is determined largely by the mode of hairdressing for women.

GLASS PROCESSING

The processing of glass by cutting, beveling, bending, grinding, engraving, staining, and ornamenting, including cut-glass tableware, druggists' and scientific glassware, and leaded or stained-glass windows, is an industry of considerable importance, in which there were 34 New England establishments engaged in 1925. The output of 7 concerns in Connecticut and 24 in Massachusetts had a value of $3,250,000 and contributed considerably more than $1,500,000 to their manufacturing revenue. The output of Connecticut had a greater value than that of Massachusetts, although the latter State employed twice as many wage earners and added a greater amount—nearly $1,000,000—to its manufacturing revenue. There were also 2 concerns in Rhode Island and 1 in Maine with no production figures.

New England shows a considerable increase since 1914 in its share of the country's value of product. Census figures for 1927 show considerable reduction below those for 1925. (See table, p. 574.)

Sales trends of reporting companies show a pronounced increase from 1921 to 1923, which was exceeded by the volume of 1925. Their production in the latter year was generally low, as is shown by a group average of only 59 per cent capacity. Most of the plants in Massachusetts, however, were operating at 80 per cent capacity or above, while those in Connecticut averaged considerably lower.

Increases in total sales volume were reported by three-fourths of the Massachusetts companies and by one-fourth of the Connecticut concerns. The increase in building, together with some decrease in importations of stained glass, were cited as reasons for increasing business; while decreases were attributed to changes in popular demand and increased competition. The majority of sales were said by most of the reporting companies to be made to the New England market; but several Connecticut plants stated that half or more of their sales were made outside New England. The average New England sales for the reporting group was 79 per cent of total business. Sales of glass for buildings and windows were reported as made either direct to the consumer or through architects and contractors. Cut glass and tableware were said to be sold mainly direct through retailers and, in some cases, through exclusive distributors. Advertising, as reported, was entirely local in character, consisting mainly of dealer helps and direct mail. Less than half of the companies stated the use of a brand or trade-mark.

SUMMARY OF UNCLASSIFIED MANUFACTURES

In addition to the foregoing items that have been discussed individually, there are a number of other lines where the production is represented in New England either by a few establishments of some size or by several small concerns. These contribute substantial amounts to the manufacturing revenue of individual localities throughout the region. Their variety does not admit of separate consideration here, but a number of the more important ones for which figures are available are included in the following summary table.

IMPORTANCE OF VARIOUS UNCLASSIFIED MANUFACTURES IN NEW ENGLAND STATES, 1925 AND 1927

State, item, and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Emery wheels and other abrasives:						
Massachusetts—						
1927	14	1,753	2,795	5,510	13,482	7,971
1925	12	1,831	3,027	6,017	15,138	9,120
Connecticut—						
1927	4	57	64	369	642	273
1925	4	74	78	446	765	319
Total:						
1927	18	1,810	2,859	5,879	14,124	8,245
1925[1]	16	1,905	3,106	6,464	15,903	9,439
Massachusetts, 1914[2]	12	902	599	866	2,299	1,433
Paving material:						
Massachusetts, 1927	18	385	700	898	2,536	1,638
Massachusetts, Connecticut, and Rhode Island, 1925[3]	33	683	1,101	1,050	3,913	2,863
Connecticut, 1927	11	373	655	326	2,321	1,995
Total, 1927	29	758	1,356	1,224	4,858	3,633
Optical goods:						
Massachusetts—						
1925	19	2,569	2,895	3,636	10,783	7,145
Rhode Island—						
1927	5	292	279	387	961	573
1925	4	216	237	258	622	364
Total:						
1925[4]	23	2,785	3,133	3,895	11,405	7,510
Massachusetts, 1914[5]	13	2,356	1,390	1,196	3,993	2,798
Professional and scientific instruments:						
Massachusetts—						
1927	26	643	871	948	3,853	2,906
1925[6]	21	425	576	603	2,590	1,986
1914[7]	23	599	417	550	1,262	712

[1] Not including Rhode Island, 1.
[2] Not including Connecticut, 2; Rhode Island, 1.
[3] Not including New Hampshire, 1; Vermont, 1.
[4] Not including Connecticut, 1.
[5] Not including Connecticut, 4; Maine, 1; New Hampshire, 2; Rhode Island, 3.
[6] Not including Connecticut, 4; Rhode Island, 3.
[7] Not including Connecticut, 6; Maine, 1; New Hampshire, 1; Rhode Island, 2.

IMPORTANCE OF VARIOUS UNCLASSIFIED MANUFACTURES IN NEW ENGLAND STATES, 1925 AND 1927—Continued

State, item, and year	Establishments	Wage earners	Thousands of dollars			
			Wages	Cost of materials	Value of products	Value added by manufacture
Models and patterns:						
Massachusetts, 1927	60	459	825	307	2, 077	1, 769
Connecticut, Rhode Island, and Massachusetts, 1925 [8]	97	729	1, 322	545	2, 959	2, 414
Connecticut, 1927	21	132	243	81	501	420
Rhode Island, 1927	6	50	74	27	131	104
Total, 1927	87	641	1, 143	415	2, 709	2, 293
Roofing material: Massachusetts, 1925	6	507	645	4, 789	9, 005	4, 216
Buttons:						
Connecticut, 1927	10	796	867	1, 118	2, 866	1, 748
Connecticut and Massachusetts, 1925 [9]	24	1, 027	999	1, 154	3, 192	2, 038
Massachusetts, 1927	7	99	64	122	320	198
Connecticut and Massachusetts, 1914 [10]	32	1, 348	723	889	2, 226	1, 337
Combs and hairpins:						
Massachusetts—						
1927	19	960	903	1, 205	2, 938	1, 733
1925 [1]	22	929	855	1, 107	2, 856	1, 749
1914 [11]	34	1, 944	968	2, 074	3, 727	1, 653
Glass processing:						
Massachusetts—						
1927	22	163	263	328	1, 008	680
1925	24	414	562	450	1, 437	986
Connecticut—						
1927	6	241	335	739	1, 294	554
1925	7	209	282	1, 213	1, 838	626
Total—						
1927	28	404	597	1, 067	2, 301	1. 234
1925 [12]	31	623	845	1, 663	3, 275	1, 612
Jewelry and instrument cases:						
Massachusetts, 1927	12	458	496	672	1, 624	953
Massachusetts and Rhode Island, 1925 [13]	22	872	756	1, 037	2, 936	1, 899
Rhode Island, 1927	8	264	242	225	666	441
Total, 1927	20	722	738	897	2, 291	1, 394
Signs and advertising novelties:						
Massachusetts, 1927	22	338	436	381	1, 284	902
Connecticut, Maine, and Massachusetts, 1925 [14]	46	493	630	761	2, 182	1, 422
Connecticut, 1927	13	80	125	122	458	336
Maine, 1927	4	27	33	33	109	76
Rhode Island, 1927	3	15	26	9	55	46
Total—						
1927	42	460	620	546	1, 906	1, 360
Soda-water apparatus: Massachusetts, 1925	4	258	354	602	1, 816	1, 215
Surgical appliances: Connecticut, 1925 [15]	6	232	183	1, 649	2, 281	632

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[8] Not including Maine, 1.
[9] Not including Maine, 1; Rhode Island, 2; New Hampshire, 1.
[10] Not including New Hampshire, 1; Rhode Island, 2.
[11] Not including Connecticut, 1; Rhode Island, 1.
[12] Not including Maine, 1; Rhode Island, 2.
[13] Not including Connecticut, 2.
[14] Not including New Hampshire, 1; Rhode Island, 3.
[15] Not including Maine, 1; Massachusetts, 12; Rhode Island, 1.

Part V.—BUILDING AND CONSTRUCTION

The construction of buildings, public works, streets, and highways is one of the economic activities of New England that is of substantial importance as a source of income to many persons who contribute labor, services, and materials. In this sense construction may be regarded as parallel to the manufacturing activities of the region, although it is in a distinct and individual field. In this activity the raw materials used in building or construction work are turned into a finished manufactured product in the form of the completed structure or project. The principal difference between this type of activity and manufacturing is that the finished product remains permanently at the place where it is fabricated and that it is a product of continuous utility.

BUILDINGS AND PUBLIC WORKS

The present discussion undertakes to present the importance of the different types of building and construction in the New England States and their distribution throughout the territory. The market which these activities afford for the principal materials—lumber, cement, iron and steel, brick, and sewer pipe—is considered in the analysis of the respective manufacturing industries, in which they have already been discussed.

Marked activity in building and construction has been shown by the New England States during recent years. This has followed the general trend of building activity in the United States. During the past six years the value of contracts awarded in New England has averaged in the neighborhood of $400,000,000 annually. Building contracts in this section since 1923 compare very favorably with the increased activity in other parts of the United States. The value of the awards in 1925 was 43 per cent greater than that of 1923, and in 1926 it was 32 per cent above 1923.

The figures presented and analyzed here are based upon reports of the F. W. Dodge Corporation of New York. The first table shows the valuation, the number of square feet of floor space, and the number of projects in different classes according to contracts awarded in each year from 1923 to 1928. This table is followed by an analysis of this construction in the individual States.

BUILDING IN NEW ENGLAND AS A WHOLE, CONTRACTS AWARDED, 1923–1928

Type of construction	1923	1924	1925	1926	1927	1928	Total
Commercial:							
Number of projects	2,532	2,233	2,145	2,218	2,036	2,194	13,358
Floor space (square feet)	10,848,700	9,918,500	13,962,500	12,159,500	2,508,000	11,069,900	66,467,100
Valuation	$55,676,800	$53,217,500	$77,849,900	$69,941,300	$53,807,800	$62,482,400	372,975,700
Industrial:							
Number of projects	644	488	484	565	577	650	3,408
Floor space (square feet)	6,211,400	3,988,900	6,010,700	4,486,600	4,418,800	5,741,000	30,857,400
Valuation	$29,343,900	$22,508,400	$41,050,800	$37,036,900	$31,361,200	$86,648,300	$247,949,500
Public works and utilities:							
Number of projects	675	586	626	710	941	1,057	4,595
Floor space (square feet)	551,100	311,200	901,700	612,000	662,400	1,180,100	4,218,500
Valuation	$35,501,000	$27,005,300	$35,809,000	$53,573,000	$50,079,400	$62,873,800	264,841,500
Residential:							
Number of projects	10,917	11,319	13,868	14,638	14,696	16,333	81,771
Floor space (square feet)	36,709,800	39,069,100	49,648,500	44,748,600	39,210,600	44,828,400	554,215,000
Valuation	$156,852,400	$178,309,200	$216,815,900	$185,324,800	$185,324,800	$203,348,900	1,138,340,100
All other:							
Number of projects	813	863	980	1,006	1,136	1,176	5,974
Floor space (square feet)	8,341,800	9,321,800	12,700,000	9,210,700	10,444,200	10,177,000	60,195,600
Valuation	$55,482,600	$71,154,700	$105,655,400	$82,941,000	$92,194,100	$80,227,600	$487,655,400
Total, New England:							
Number of projects	15,581	15,489	18,069	19,137	19,457	21,410	109,143
Floor space (square feet)	62,662,900	62,609,500	83,223,400	71,217,400	63,244,000	72,996,400	415,953,600
Valuation	$332,856,700	$352,195,100	$477,181,000	$441,183,100	$412,767,300	$495,581,000	$2,511,764,200
Total Middle Atlantic:							
Number of projects	11,345	13,238	16,407	14,910	16,424	16,433	88,757
Floor space (square feet)	70,208,500	75,208,500	96,726,300	97,481,700	96,960,000	112,276,700	548,861,700
Valuation	$374,181,800	$477,746,300	$552,318,000	$689,414,000	$721,148,300	$787,672,800	$3,602,481,200
Total Central West:							
Number of projects	29,738	31,613	40,181	41,878	53,130	66,912	263,452
Floor space (square feet)	155,242,100	153,161,500	222,827,700	221,504,300	245,260,500	284,096,500	1,282,092,600
Valuation	$1,006,422,100	$1,049,585,900	$1,487,309,900	$1,669,042,800	$1,812,848,700	$1,934,774,900	$8,959,984,300
Total, Southeast:							
Number of projects	14,572	24,116	30,779	25,891	26,520	26,196	147,074
Floor space (square feet)	87,954,300	101,198,900	126,521,600	98,512,500	81,023,800	88,583,300	581,794,400
Valuation	$486,757,000	$606,255,400	$779,131,900	$730,316,700	$610,789,300	$560,925,400	$3,774,175,700

BUILDING ACTIVITY IN NEW ENGLAND STATES, CONTRACTS AWARDED, 1923–1928

Type and year	Maine	Vermont	New Hampshire	Massachusetts	Connecticut	Rhode Island	Total
TOTAL CONSTRUCTION							
1928:							
Number of projects	645	289	443	12, 513	5, 256	2, 264	21, 410
Floor space (square feet)	2, 434, 000	796, 200	1, 473, 900	43, 543. 600	19, 166, 100	5, 582, 600	72, 996, 400
Valuation	$23, 489, 700	$11, 878, 500	$50, 118, 300	$255, 838, 800	$119, 124, 100	$35, 131, 600	$495, 581, 000
1927:							
Number of projects	531	185	426	12, 112	4, 285	1, 918	19, 457
Floor space (square feet)	2, 038, 500	654, 900	1, 143, 800	39, 010, 100	14, 739, 800	5, 656, 900	63, 244, 000
Valuation	$17, 689, 700	$7, 545, 700	$8, 690, 400	$238, 196, 600	$100, 732, 400	$39, 912, 500	$412, 767, 300
1926:							
Number of projects	[illegible]	117	337	11, 946	4, 275	1, 974	19, 137
Floor space (square feet)	1, 865, 500	457, 600	1, 362, 500	44, 791, 400	16, 087, 000	6, 653, 400	71, 217, 400
Valuation	$22, 275, 600	$10, 374, 900	$9, 592, 500	$255, 054, 500	$102, 500, 600	$41, 385, 000	$441, 183, 100
1925:							
Number of projects	394	102	273	11, 706	4, 013	1, 581	18, 069
Floor space (square feet)	1, 996, 000	627, 200	1, 381, 900	55, 885, 200	17, 828, 200	5, 504, 900	83, 223, 400
Valuation	$16, 704, 600	$4, 625, 700	$10, 045, 200	$309, 854, 200	$101, 348, 500	$24, 602, 800	$477, 181, 000
1924:							
Number of projects	[illegible]	116	228	9, 533	3, 695	1, 591	15, 489
Floor space (square feet)	1, 369, 700	514, 500	1, 053, 800	39, 706, 300	14, 699, 500	5, 265, 700	62, 609, 500
Valuation	$9, 538, 400	$4, 770, 700	$6, 670, 500	$215, 725, 000	$86, 064, 600	$29, 425, 900	$352, 195, 100
1923:							
Number of projects	462	152	309	9, 719	3, 500	1, 439	15, 581
Floor space (square feet)	2, 218, 700	681, 900	1, 402, 900	38, 426, 900	14, 692, 800	5, 239, 700	62, 662, 900
Valuation	$13, 970, 300	$5, 032, 300	$8, 462, 800	$200, 245, 400	$78, 855, 400	$26, 290, 500	$332, 856, 700
Total of 6 years:							
Number of projects	2, 846	961	2, 016	67, 529	25, 024	10, 767	109, 143
Floor space (square feet)	11, 922, 400	3, 732, 300	7, 818, 800	261, 363, 500	97, 213, 400	33, 903, 200	415, 953, 600
Valuation	$103, 668, 300	$44, 227, 800	$93, 579, 700	$1,474,914,500	$588, 625, 600	$206, 748, 300	$2, 511, 764, 200
RESIDENTIAL							
1928:							
Number of projects	376	167	236	9, 606	4, 087	1, 861	16, 333
Floor space (square feet)	803, 000	374, 000	493, 800	28, 695, 000	10, 885, 600	3, 577, 000	44, 828, 400
Valuation	$3, 605, 700	$1, 786, 800	$2, 622, 000	$127, 259, 100	$52, 153, 900	$15, 921, 400	$203, 348, 900
1927:							
Number of projects	307	51	243	9, 256	3, 320	1, 519	14. 696
Floor space (square feet)	700, 600	150, 900	447, 300	25, 910, 800	8, 733, 900	3, 267, 100	39, 210, 600
Valuation	$4, 131, 800	$981, 500	$2, 401, 600	$118, 849, 800	$43, 187, 100	$15, 773, 000	$185, 324, 800
1926:							
Number of projects	253	18	200	9, 194	3, 301	1, 672	14, 638
Floor space (square feet)	781, 700	57, 300	541, 700	28, 865, 300	10, 537, 700	3, 964, 900	44, 748, 600
Valuation	$4, 094, 100	$416, 500	$3, 286, 500	$125, 172, 500	$49, 045, 400	$15, 673, 900	$197, 688, 900

BUILDING ACTIVITY IN NEW ENGLAND STATES, CONTRACTS AWARDED, 1923–1928—Continued

Type and year	Maine	Vermont	New Hampshire	Massachusetts	Connecticut	Rhode Island	Total
RESIDENTIAL—continued							
1925:							
Number of projects	196	20	141	9, 112	3, 089	1, 310	13, 868
Floor space (square feet)	542, 200	167, 800	418, 000	34, 872, 200	10, 384, 400	3, 263, 900	49, 648, 500
Valuation	$2, 295, 800	$619, 500	$2, 000, 200	$153, 725, 600	$45, 013, 100	$13, 161, 700	$216, 815, 900
1924:							
Number of projects	158	33	110	7, 109	2, 731	1, 178	11, 319
Floor space (square feet)	485, 900	83, 200	389, 500	25, 360, 000	9, 613, 900	3, 136, 600	39, 069, 100
Valuation	$2, 257, 500	$471, 500	$1, 711, 600	$111, 988, 300	$48, 011, 100	$13, 869, 200	$178, 309, 200
1923:							
Number of projects	254	78	159	6, 929	2, 437	1, 060	10, 917
Floor space (square feet)	760, 200	238, 400	601, 700	24, 175, 000	7, 952, 500	2, 982, 000	36, 709, 800
Valuation	$3, 775, 100	$1, 126, 500	$1, 705, 400	$103, 432, 300	$35, 279, 400	$11, 533, 700	$156, 852, 400
Total for 6 years:							
Number of projects	1, 544	367	1, 089	51, 206	18, 965	8, 600	81, 771
Floor space (square feet)	4, 073, 600	1, 071, 600	2, 892, 000	167, 878, 300	58, 108, 000	20, 191, 500	254, 215, 000
Valuation	$20, 160, 000	$1, 402, 300	$13, 727, 300	$740, 427, 600	$272, 690, 000	$85, 932, 900	$1, 138, 340, 100
COMMERCIAL							
1928:							
Number of projects	102	25	80	1, 226	612	149	2, 194
Floor space (square feet)	719, 300	81, 100	212, 500	6, 842, 500	2, 721, 600	492, 900	11, 069, 900
Valuation	$2, 492, 800	$542, 700	$1, 063, 500	$40, 290, 000	$15, 466, 100	$2, 627, 300	$62, 482, 400
1927:							
Number of projects	72	35	70	1, 236	446	177	2, 036
Floor space (square feet)	294, 500	96, 200	163, 800	5, 313, 500	1, 711, 600	928, 400	8, 508, 000
Valuation	$1, 844, 500	$629, 500	$935, 300	$31, 992, 500	$11, 862, 200	$6, 543, 800	$53, 807, 800
1926:							
Number of projects	84	20	70	1, 435	459	150	2, 218
Floor space (square feet)	312, 500	76, 300	246, 800	8, 055, 900	2, 314, 800	1, 153, 200	12, 159, 500
Valuation	$1, 366, 600	$449, 500	$1, 463, 500	$43, 363, 200	$15, 727, 100	$7, 571, 400	$69, 941, 300
1925:							
Number of projects	58	16	49	1, 428	473	121	2, 145
Floor space (square feet)	370, 700	70, 600	192, 800	9, 795, 400	2, 848, 300	684, 700	13, 962, 500
Valuation	$1, 865, 500	$490, 500	$1, 270, 300	$53, 730, 000	$16, 142, 800	$4, 350, 800	$77, 849, 900
1924:							
Number of projects	49	16	45	1, 335	518	270	2, 233
Floor space (square feet)	307, 700	81, 100	185, 900	6, 643, 900	1, 883, 300	816, 600	9, 918, 500
Valuation	$1, 492, 000	$623, 000	$1, 022, 500	$35, 253, 700	$10, 774, 100	$4, 052, 200	$53, 217, 500
1923:							
Number of projects	68	20	44	1, 614	573	213	2, 532
Floor space (square feet)	381, 200	131, 000	99, 600	7, 243, 200	2, 065, 500	928, 200	10, 848, 700
Valuation	$1, 818, 500	$707, 000	$618, 500	$37, 352, 500	$11, 147, 700	$4, 032, 600	$55, 676, 800

Total for 6 years:							
Number of projects	433	132	358	8, 274	3, 081	1, 080	13, 358
Floor space (square feet)	2, 385, 900	536, 300	1, 101, 400	43, 894, 400	13, 545, 100	5, 004, 000	66, 467, 100
Valuation	$10, 879, 900	$3, 442, 200	$6, 373, 600	$241, 981, 900	$81, 120, 000	$29, 178, 100	$372, 975, 700
INDUSTRIAL							
1928:							
Number of projects	26	12	23	333	163	93	650
Floor space (square feet)	217, 900	78, 400	295, 200	2, 246, 200	2, 292, 100	610, 700	5, 741, 000
Valuation	$9, 212, 800	$916, 000	$40, 761, 500	$15, 474, 500	$16, 562, 000	$3, 721, 500	$86, 648, 300
1927:							
Number of projects	23	22	20	327	129	56	577
Floor space (square feet)	533, 500	196, 300	66, 700	2, 424, 100	740, 400	457, 800	4, 418, 800
Valuation	$6, 140, 500	$2, 506, 000	$405, 500	$12, 457, 100	$7, 837, 000	$2, 015, 100	$31, 361, 200
1926:							
Number of projects	30	10	15	301	171	38	565
Floor space (square feet)	177, 400	52, 200	97, 500	2, 743, 700	960, 600	455, 200	4, 486, 600
Valuation	$2, 156, 200	$4, 834, 000	$1, 338, 000	$18, 487, 200	$8, 700, 000	$1, 521, 500	$37, 036, 900
1925:							
Number of projects	22	10	20	264	137	31	484
Floor space (square feet)	391, 600	137, 800	152, 200	3, 713, 200	1, 361, 700	254, 200	6, 010, 700
Valuation	$5, 627, 400	$520, 000	$1, 590, 000	$21, 966, 400	$7, 507, 000	$3, 840, 000	$41, 050, 800
1924:							
Number of projects	17	16	14	253	133	55	488
Floor space (square feet)	221, 800	170, 200	112, 300	2, 084, 500	936, 900	463, 200	3, 988, 900
Valuation	$1, 679, 000	$991, 000	$524, 000	$10, 404, 000	$5, 971, 400	$2, 939, 000	$22, 508, 400
1923:							
Number of projects	19	12	29	333	176	75	644
Floor space (square feet)	353, 700	141, 700	255, 100	2, 475, 000	2, 319, 700	666, 200	6, 211, 400
Valuation	$1, 160, 500	$1, 083, 000	$1, 491, 500	$11, 960, 500	$11, 095, 400	$2, 553, 000	$29, 343, 900
Total for 6 years:							
Number of projects	137	82	121	1, 811	909	348	3, 408
Floor space (square feet)	1, 895, 900	776, 600	979, 000	15, 687, 200	8, 611, 400	2, 907, 300	30, 857, 400
Valuation	$25, 976, 400	$10, 850, 000	$46, 110, 500	$90, 749, 700	$57. 672, 800	$16, 590, 100	$247, 949, 500
PUBLIC WORKS AND UTILITIES							
1928:							
Number of projects	60	54	37	680	146	80	1, 057
Floor space (square feet)	21, 700	7, 000	1, 000	884, 700	39, 000	226, 700	1, 180, 100
Valuation	$4, 256, 900	$6, 938, 000	$1, 765, 900	$32, 943, 600	$10, 392, 500	$6, 576, 900	$62, 873, 800
1927:							
Number of projects	39	27	29	599	177	70	941
Floor space (square feet)	5, 400	1, 100		485, 700	165, 100	5, 100	662, 400
Valuation	$1, 661, 400	$1, 479, 300	$1, 437, 400	$26, 680, 700	$11, 413, 600	$7, 407, 600	$50, 079, 400
1926:							
Number of projects	38	42	6	450	129	45	710
Floor space (square feet)	30, 700	8, 000		391, 100	169, 600	12, 600	612, 000
Valuation	$10, 459, 800	$2, 694, 400	$274, 500	$25, 333, 100	$8, 986, 800	$5, 824, 400	$53, 573, 000
1925:							
Number of projects	34	29	17	401	106	39	626
Floor space (square feet)	60, 700	16, 000	3, 000	591, 100	204, 500	26, 400	901, 700
Valuation	$2, 516, 800	$1, 180, 800	$982, 700	$22, 160, 400	$6, 638, 700	$2, 329, 600	$35, 809, 000

BUILDING ACTIVITY IN NEW ENGLAND STATES, CONTRACTS AWARDED, 1923–1928—Continued

Type and year	Maine	Vermont	New Hampshire	Massachusetts	Connecticut	Rhode Island	Total
PUBLIC WORKS AND UTILITIES—continued							
1924:							
Number of projects	42	25	18	364	106	31	586
Floor space (square feet)	12, 500	14, 000	10, 000	158, 700	56, 000	60, 000	311, 200
Valuation	$2, 000, 400	$1, 341, 200	$937, 400	$16, 456, 500	$4, 581, 900	$1, 687, 900	$27, 005, 300
1923:							
Number of projects	55	23	29	393	132	43	675
Floor space (square feet)	197, 300	26, 900	5, 000	121, 400	154, 500	46, 000	551, 100
Valuation	$4, 189. 000	$1, 253, 800	$1, 997, 400	$17, 167, 400	$6, 938, 800	$3, 954, 600	$35, 501, 000
Total for 6 years:							
Number of projects	268	200	136	2, 887	796	308	4, 595
Floor space (square feet)	328, 300	73, 000	19, 000	2, 632, 700	788, 700	376, 800	4, 218, 500
Valuation	$25, 084, 300	$14, 887, 500	$7, 395, 300	$140, 741, 700	$48, 951. 700	$27, 781, 000	$264, 841, 500
ALL OTHER							
1928:							
Number of projects	81	31	67	668	248	81	1, 176
Floor space (square feet)	672, 100	255, 700	471, 400	4, 874, 700	3, 227, 800	675, 300	10, 177, 000
Valuation	$3, 921, 500	$1, 695, 000	$3, 905, 400	$39, 871, 600	$24, 549, 600	$6, 284, 500	$80, 227, 600
1927:							
Number of projects	19	50	64	694	213	96	1, 136
Floor space (square feet)	504, 500	210, 400	466, 000	4, 876, 000	3, 388, 800	998, 500	10, 444, 200
Valuation	$3, 911, 500	$1, 949, 400	$3, 510, 600	$48, 216, 500	$26, 433, 100	$8, 173, 000	$92, 194, 100
1926:							
Number of projects	83	27	46	566	215	69	1, 006
Floor space (square feet)	563. 200	263, 800	476, 500	4, 735, 400	2. 104, 300	1, 067, 400	9, 210, 700
Valuation	$4, 196, 900	$1, 980, 500	$3, 230, 000	$42, 698, 500	$20, 041, 300	$10, 793, 800	$82, 941, 000
1925:							
Number of projects	118	27	46	501	208	80	980
Floor space (square feet)	630, 800	235. 000	615, 900	6, 913, 300	3, 029, 300	1, 275, 700	12, 700, 000
Valuation	$4, 399, 100	$1, 814, 900	$4, 202, 000	$58, 271, 800	$26, 046, 900	$10, 920, 700	$105, 655, 400
1924:							
Number of projects	60	26	41	472	207	57	863
Floor space (square feet)	341, 800	166, 000	356, 100	5, 459, 200	2, 209, 400	789, 300	9, 321, 800
Valuation	$2, 109, 500	$1, 344, 000	$2, 475, 000	$41, 622, 500	$16, 726, 100	$6, 877, 600	$71, 154, 700
1923:							
Number of projects	66	19	48	450	182	48	813
Floor space (square feet)	526, 300	143. 900	441, 500	4, 412, 300	2, 200, 600	617, 300	8, 341, 900
Valuation	$3, 027, 200	$862, 000	$2, 650, 000	$30, 332, 700	$14, 394, 100	$4, 216, 600	$55, 482, 600
Total for 6 years:							
Number of projects	427	180	312	3, 351	1, 273	431	5, 974
Floor space (square feet)	3, 238, 700	1, 274, 800	2, 827, 400	31, 270, 900	16, 160, 200	5, 423, 600	60, 195, 600
Valuation	$21, 565, 700	$9, 645, 800	$19, 973, 000	$261, 013, 600	$128, 191, 100	$17, 266, 200	$487, 655, 400

CLASSES OF CONSTRUCTION

COMMERCIAL BUILDING

New England has shown a higher percentage of values in the construction of commercial buildings during the past few years than was shown either in the division of 21 Northeastern States or in 9 States of the Southeast. A certain amount of this construction has undoubtedly consisted of replacements of lower and smaller buildings by more modern and more spacious construction in the metropolitan centers of New England. Construction of office buildings and of hotels has been particularly active in Boston, Providence, and several other of the larger cities. Construction of commercial buildings during the past six years in New England has averaged in the neighborhood of 16 per cent of the total valuation of all building contracts awarded.

RESIDENTIAL BUILDING

Construction of residences comprised from 45 to 50 per cent of the total New England construction in the past six years. This proportion is slightly higher than that for residential construction in the other Northeastern States and exceeds considerably the percentage in the Southeastern States. Considerable activity shown in building apartment houses in the larger cities has increased the relative importance of this type of construction. Another significant factor is the necessary replacement of poorer and outgrown residences throughout New England. An important element in the cost of residential construction is the necessity for sturdier types of residences in New England to withstand its climatic conditions. This is true particularly in comparison with the Southeastern States. Construction of a New England residence may require from 30 to 40 per cent more lumber and other materials than are needed in Florida and Georgia.

INDUSTRIAL BUILDING

New England shows a smaller percentage of building contracts awarded for industrial structures than the other States of the Northeast or of the Southeast. This fact may be explained by the maturity of New England's industrial development. Its building program for mills and factories was completed earlier, and present facilities are generally still adequate.

PUBLIC WORKS AND PUBLIC UTILITIES

There has been a decidedly smaller percentage of public construction in recent years in New England than in the other geographical groups of States. Because of the more fully developed nature of most New England communities, the construction of streets, sidewalks, electric systems, power plants, sewer systems, and other public utilities was for the most part completed many years ago. Developments along these lines took place sooner and more gradually than in the newer portions of the country; hence present activity in these public improvements is not particularly marked. On the other hand the rapid growth of communities in other States, particularly in the Southeast, has made necessary considerable construction of these utilities in the newer sections.

OTHER TYPES OF CONSTRUCTION

In New England the construction of educational buildings shows a slightly higher percentage of total valuation than in the other States of the Northeast or in the Southeast. This type of construction in New England was especially important in 1924 and 1925. Heavy building programs in the larger educational institutions, particularly at Harvard and at Yale University, had an important influence in the total for this class. Considerable activity in the construction of public-school buildings was also reported in Massachusetts.

Hospitals and other public institutions represent a small percentage of the total construction. Contracts awarded in different New England cities were in practically the same proportion to the total as in the other States with which comparisons are made.

Construction of religious and memorial buildings shows practically the same degree of activity as in the other sections. In social and recreational buildings the proportion in New England was slightly less, although it showed some increase in 1925 and 1926.

CHANGES IN COST OF CONSTRUCTION

Indexes of prices of building material and of construction costs during the years previously considered do not indicate any considerable degree of change. So many offsetting factors are present in these costs that reduction of the figures to a common price or valuation basis seems hardly warranted. The general extent of changes in cost of materials and construction may be observed from the following table, which gives index numbers recorded from 5 different groups, covering the years from 1920 through 1928.

BUILDING MATERIAL PRICES AND CONSTRUCTION COSTS

[Index numbers: Year 1913=100, except "factory building costs," 1914=100]

Year	Wholesale building material prices	Construction costs	Factory building costs	Frame house materials (retail prices)	Brick house materials (retail prices)
Monthly average:					
1920	264	251	----------	----------	----------
1921	165	202	179	----------	----------
1922	169	175	170	182	186
1923	190	214	202	206	209
1924	175	215	198	201	203
1925	175	207	195	196	197
1926	173	208	197	195	195
1927	163	206	193	187	188
1928	----------	207	191	178	183

Sources: Wholesale building material prices, Department of Labor; construction costs—material and labor, Engineering News-Record; factory building costs, Aberthaw Co.; frame-house materials and brick-house materials, retail prices, Department of Commerce.

HIGHWAY AND STREET CONSTRUCTION

Highway and street construction is of interest both to the local residents within New England and to the increasing number of visitors who motor over its roads each season. The decline in horse-drawn traffic since the advent of the automobile and the tremendous growth of motor traffic in all sections of the country make the condition of the highways a matter of very broad general interest.

The individual States of New England have done a great deal to provide the best possible highways for the service of their own communities as well as to make the scenic and recreational attractions of the region conveniently accessible to visitors from outside their boundaries. Through the system of Federal and State aid, the main arteries of traffic have been developed and kept in first-class condition. This involves the annual outlay of many millions of dollars. Contracts awarded on the State highway systems and on rural highways under local government control are estimated to amount annually to some $25,000,000.

HIGHWAYS

MILEAGE OF VARIOUS TYPES

The general type of highways constructed in New England shows, as a whole, some marked variations from that in other sections of the country. These variations arise partly from the type of materials available, partly from considerations of construction costs and traffic requirements, and partly as the result of differing policies of the various State highway departments. Some of these special circumstances grow out of the fact that New England has had a longer period of development than other sections of the country. Other conditions are matters of public policy, and still others spring from the high density of population and the attendant dense traffic in this region.

The highway systems of the United States belong to two distinct classes. The first of these includes the mileage in the State highway systems which is under the administrative control of the State highway departments. The second class includes highways under the control of local authorities such as towns, townships, and counties. Highways under State control in New England comprise a larger proportion of the total than in many other parts of the country. The mileage in its State highway systems in 1924 was approximately 14 per cent of the total mileage of all highways in the region as a whole. This high percentage reflects the organized public interest of the region in the maintenance and construction of its facilities for highway transportation.

The following table shows the extent of the State highway mileage in New England and also that in the rest of the United States, together with the mileage of different types of surface in the individual States. At the end of 1927 the State highway systems of New England comprised 12,747 miles.

MILEAGE AND TYPES OF ROADS IN NEW ENGLAND STATE HIGHWAY SYSTEMS AT END OF 1927[1]

State	Grand total mileage	Unimproved	Total surfaced	Sand-clay top soil	Gravel, chert, etc.	Water-bound macadam, treated and non-treated
Maine	1, 788	293	1, 495	4	1, 171	8
New Hampshire	2, 310	239	2, 071	----------	1, 699	117
Vermont	4, 226	982	3, 245	1, 000	2, 033	49
Massachusetts	1, 590	25	1, 565	----------	111	285
Rhode Island	867	388	479	----------	23	118
Connecticut	1, 966	115	1, 851	----------	363	765
Total	12, 747	2, 042	10, 706	1, 004	5, 400	1, 342
United States	293, 353	116, 786	176, 566	12, 581	86, 095	17, 752
Outside of New England	280, 606	114, 744	165, 860	11, 577	80, 695	16, 410

[1] As reported by U. S. Bureau of Public Roads.

MILEAGE AND TYPES OF ROADS IN NEW ENGLAND STATE HIGHWAY SYSTEMS AT END OF 1927[1]

State	Bituminous macadam	Sheet asphalt	Bituminous concrete	Portland-cement concrete	Brick and block
Maine	224	----------	----------	88	----------
New Hampshire	159	----------	71	24	----------
Vermont	63	----------	----------	100	----------
Massachusetts	711	----------	214	242	3
Rhode Island	134	8	120	76	----------
Connecticut	243	----------	148	331	2
Total	1, 534	8	553	861	5
United States	13, 496	1, 332	5, 066	36, 915	3, 330
Outside of New England	11, 962	1, 324	4, 513	36, 054	3, 325

[1] As reported by U. S. Bureau of Public Roads.

The improved condition of the State highways of New England is indicated from the fact that approximately 80 per cent of the total mileage included in the State highway systems has been surfaced. The proportion for the United States outside New England is only 52.5 per cent. In the three northern States of this region the percentage is somewhat lower than the New England average. In these northern States the general policy has been to surface the highways as extensively as possible with gravel and water-bound macadam, rather than the more expensive types of surfacing. These lower types are being replaced by the higher grades of surfacing as rapidly as the traffic and industrial development warrant the larger outlays. Within the last few years the emphasis has been increasingly upon the more durable types of concrete and other high-grade construction.

EXPENDITURE FOR MAINTENANCE AND FOR NEW CONSTRUCTION

Construction of State highways in New England began when other States were doing very little in this direction. The types of highways constructed at that time were naturally those which had proved most successful. Many of the New England highways were built before the development of the types which are now used widely for construction. Policies of State highway departments in the selection of materials and types are now influenced considerably by this earlier construction.

New England has reached the point where maintenance of existing highways absorbs the greater share of the total outlay, and new construction has become of less and less importance. According to statistics compiled by the Bureau of Public Roads, the New England States in 1924 spent only 52 per cent of their highway funds on new construction, in comparison with 64 per cent for the United States outside New England. New England spent 36.4 per cent of its total disbursements on maintenance of highways, while the rest of the United States spent 16 per cent for this purpose.

In road building, as in other phases of construction, New England is divided into two rather distinct sections—the first including the rural northern States of Maine, New Hampshire, and Vermont, and the second embracing the more industrial southern region in Massachusetts, Rhode Island, and Connecticut. Variations between these two sections in population, industrial development, and traffic density have had a distinct influence upon the character and extent of highway construction.

In the three northern States, 56.5 per cent of the total highway funds was spent in 1924 for new construction; and in the three southern States new construction absorbed only 49.3 per cent. Thus, the proportional outlay for new construction was considerably higher in northern than in southern New England. Outlays for maintenance of existing highways, on the other hand, were considerably less in the northern, amounting to 31.3 per cent, than in the southern States, where they comprised 38.8 per cent. Detailed figures for each State are shown in the following table.

DISBURSEMENT OF STATE HIGHWAY EXPENDITURES IN THE NEW ENGLAND STATES AS COMPARED WITH THE REST OF THE UNITED STATES IN 1927

State	Total disbursements of State Highway Department	Amount spent in constructing roads and bridges	Per cent of total	Amount spent for maintenance on roads and bridges	Per cent of total
Maine	$8, 864, 263	$5, 134, 208	17. 7	$1, 569, 850	57. 9
New Hampshire	3, 564, 979	1, 410, 409	46. 1	1, 645, 113	39. 6
Vermont	4, 080, 316	2, 421, 285	32. 3	1, 319, 148	59. 3
Massachusetts	18, 379, 612	10, 803, 947	15. 0	2, 753, 600	58. 8
Rhode Island	4, 242, 096	1, 362, 705	44. 0	1, 868, 262	32. 1
Connecticut	12, 783, 981	7, 885, 544	33. 9	4, 335, 820	61. 7
Total	51, 915, 247	29, 018, 098	26. 0	13, 491, 793	55. 9
United States	699, 875, 182	400, 038, 378	19. 8	138, 783, 358	57. 2
United States, outside New England	647, 959, 935	371, 020, 280	19. 3	125, 291, 565	57. 3

KINDS OF MATERIAL AND CONSTRUCTION

Construction of highways and streets commonly requires three or more layers of material. At the bottom is the sub-base for the foundation and drainage. On top of this is laid the main or base course, and on top of this is placed the filler or wearing course. In some cases an intermediate course is also used.

The common classification of streets and highways is according to the type of surface or wearing course. On this basis there are three general groups or classes, designated as the low-type group, the medium-type group, and the high-type group.

The low-type group has a surface of sand-clay or of untreated gravel. In this type of construction no separate base or wearing course is constructed. In making an untreated gravel road a layer of gravel is laid directly on the graded roadbed.

The medium type of surfacing includes several kinds of macadam, designated as water-bound, surface-treated, and bituminous. The water-bound macadam surface is made by spreading a course of broken stone or stone dust and screenings upon a sub-base, and then watering the course and rolling it until the mud flushes to the surface, resulting in a natural cementing process. With the surface-treated macadam a bituminous layer of tar or asphaltic oil is applied, together with sand, to the gravel or water-bound macadam surface. In the construction of bituminous macadam an application of bituminous material is made to a surface course of broken stone in such manner that it penetrates this surface course and binds the material together in a solid mass.

The high-type surfacing includes constructions of cement concrete, of bituminous concrete, and of sheet asphalt pavement, as well as block pavements made of wood, stone, or brick. These types of construction require, in addition to the surface layer, the preparation of a base of concrete or macadam of considerable depth. This calls for substantial quantities of material in the form of crushed stone, gravel, or other inert material sufficient to support the heavy traffic for which this type of construction is designed, in addition to cement or other binding material. The common classification of streets and highways only from the standpoint of the surface layer does not give an adequate conception of all materials that enter into construction.

Gravel.—Gravel surfacing in New England at the close of 1925 represented 43.7 per cent of that on all State highways, and comprised a total of 4,245 miles. This is approximately the same proportion as exists in the United States outside New England. There is comparatively little of the lower types of surfacing in southern New England, and a correspondingly greater proportion of the higher types. All but 68 miles of the total gravel surfacing on New England highways were in the three northern States. In Vermont 95 per cent of the State highways are surfaced with untreated gravel. In Maine 44.7 per cent of the State highway mileage is surfaced by this method.

Surface-treated macadam or gravel.—Surface-treated macadam and gravel make up nearly one-third of the total State highway mileage in New England. This exceeds considerably the proportion in other sections, which amounts to only 9.5 per cent in the States outside New England. The percentage of bituminous macadam in the New England States also exceeds that for the country outside. The mileage of untreated water-bound macadam in the New England States is comparatively small.

Bituminous concrete.—Bituminous-concrete surface forms a larger portion of the State highway mileage in New England than in the mileage outside. In Rhode Island this type of surface represents 33 per cent of the State highway mileage, and in Massachusetts 12.6 per cent.

Cement concrete.—In cement-concrete construction New England is considerably lower than the country as a whole. This is attributed to the fact that this type of construction is a comparatively recent development. Much of the highway construction in southern New England had been completed before the general adoption of cement-concrete construction by State highway officials. The use of this type had no particular significance in highway construction until about 1913. Nearly four times as many square yards of cement highway were laid in 1919 as in 1914. The early adoption of bituminous surfacing in New England has favored continuation of this type. In recent years, however, the amount of cement-concrete construction has greatly increased.

Brick.—Use of brick surfacing in State highway construction is practically negligible in New England. This may be explained by the high cost of this type, and by the lack of production of paving brick in New England States.

ANALYSIS OF MILEAGE

Analysis of the mileage of different types of highways existing in the individual States of New England is presented in the following table.

Country and Rural Roads in New England States by Types of Construction at End of 1925

	Maine	New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut	Total, New England
Total rural roads not in State system: Miles	19, 306. 0	11, 721. 0	10, 408. 0	17, 541. 0	1, 606. 0	11, 474. 0	72, 056. 0
Rural roads surfaced:							
Miles	3, 059. 8	125. 6	1, 613. 0	6, 359. 2	371. 2	884. 5	12, 413. 3
Per cent of total	15. 9	1. 0	15. 5	36. 3	23. 1	7. 7	17. 2
Character of surface:							
Gravel, untreated—							
Miles	2, 910. 7	123. 0	1, 613. 0	2, 168. 6	113. 0	8. 4	6, 936. 7
Per cent of total surfaced	95. 1	97. 6	100. 0	34. 1	30. 4	--------	55. 9
Sand-clay—							
Miles	73. 7	--------	--------	--------	--------	--------	73. 7
Per cent of total surfaced	2. 4	--------	--------	--------	--------	--------	. 6
Surface-treated macadam and gravel—							
Miles	47. 9	--------	--------	2, 785. 7	121. 0	564. 3	3, 518. 9
Per cent of total surfaced	1. 5	--------	--------	43. 8	32. 6	. 5	28. 3
Water-bound macadam and untreated—							
Miles	9. 9	--------	--------	141. 1	48. 2	135. 4	334. 6
Per cent of total surfaced	. 3	--------	--------	2. 2	13. 0	--------	2. 7
Bituminous macadam by penetration—							
Miles	11. 7	2. 6	--------	922. 2	75. 5	100. 8	1, 112. 8
Per cent of total surfaced	. 4	2. 4	--------	14. 5	20. 3	--------	9. 0
Bituminous concrete—							
Miles	2. 5	--------	--------	275. 1	. 5	19. 7	297. 8
Per cent of total surfaced	--------	--------	--------	4. 3	--------	--------	2. 4
Portland-cement concrete—							
Miles	1. 8	--------	--------	48. 6	3. 0	51. 9	105. 3
Per cent of total surfaced	--------	--------	--------	. 7	--------	--------	. 8
Block pavements—							
Miles	. 1	--------	--------	17. 2	3. 0	--------	20. 3
Per cent of total surfaced	--------	--------	--------	. 2	. 9	--------	. 2
Sheet asphalt—							
Miles	1. 5	--------	--------	. 7	7. 0	4. 0	13. 2
Per cent of total surfaced	--------	--------	--------	--------	1. 9	--------	. 1

SEASONALITY OF HIGHWAY CONSTRUCTION

Considerable seasonal variation naturally exists in the construction of highways in New England. Projects can seldom be started before April 15, and in most cases they have to be completed by the 1st of November. The individual States prescribe various regulations on this point. The State Highway Department of Massachusetts, for example, requires that no concrete for State highway construction shall be mixed or placed when the temperature is below 35° F. Special provisions are made also for the protection of newly laid concrete in cold weather. In the southern New England States construction usually begins about 15 days earlier and closes 15 days later than in the northern States.

Contracts for building State highways are awarded mainly during the spring and early summer. On short stretches of highways contracts are awarded throughout the entire season. In Rhode Island the State highway department lets contracts at several times during the year. Contracts that are awarded in the early spring are usually completed in the same year, while those awarded late in the season are completed in the following year.

RURAL HIGHWAYS

All New England highways not included in the State systems are designated as rural highways. These are under the control of local rather than State governments and, on account of the great number of contracts let by local communities, it is difficult to obtain correct figures of construction. A greater percentage of local highways is surfaced in New England than in the other States, and most of the surfacing is of a higher type. New England shows approximately the same percentage of untreated local gravel roads as the rest of the country. Of local macadam roads having surface treatment, however, New England has a considerably higher percentage. There is also a considerably greater use of bituminous macadam. This naturally increases the market for tar, asphaltic oil, and patented types of surfacing materials.

MARKET FOR ROAD-BUILDING MATERIALS

The demand for paving asphalt and road oil is supplied almost entirely from oil refineries in the New England States. Relatively small receipts from Baltimore are reported by the trade. The centers of production of asphalt and road oil in New England are Fall River and Everett, Mass., and Providence, R. I. Practically all the paving asphalt is refined from imported Mexican petroleum. For sand, gravel, and stone the New England market is well supplied by local production.

STREET CONSTRUCTION

In order to determine the kinds of paving materials required by New England cities a questionnaire was sent to the street departments of 20 of the largest New England cities, calling for a statement regarding the total yardage of streets in these cities and a classification of different types of paving on January 1, 1927.

Tabulation of replies received from 16 of these cities shows the relative importance of different types of street paving which are believed to be fairly representative of New England cities.

TYPES OF PAVING IN 16 NEW ENGLAND CITIES AS OF JANUARY 1, 1927

State and city	Asphaltic	Cement concrete	Granite block	Wood block	Brick	Gravel
MAINE	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*
Bangor	8, 329	158, 019	8, 462	24, 441	12, 259	[1] 1, 233, 645
Portland	----------	138, 070	348, 230	----------	----------	----------
NEW HAMPSHIRE						
Manchester	107, 633	13, 917	50, 972	6, 167	----------	236, 338
VERMONT						
Rutland	35, 200	98, 100	----------	[2] 942	4, 861	----------
MASSACHUSETTS						
Boston	1, 390, 715	112, 210	2, 732, 658	269, 233	79, 956	461, 736
Fall River	7, 492	70, 430	410, 212	1, 888	1, 679	----------
Fitchburg	285, 120	----------	171, 072	8, 656	1, 856	1, 093, 280
Lawrence	----------	21, 987	436, 569	2, 187	17, 070	----------
Pittsfield	81, 877	155, 542	----------	3, 784	72, 559	500, 000
Worcester	166, 167	105, 897	396, 149	3, 462	10, 306	----------
RHODE ISLAND						
Providence	624, 423	----------	647, 304	70, 546	3, 583	----------
CONNECTICUT						
Bridgeport	12, 000	200, 000	20, 000	150, 000	25, 000	----------
Hartford	783, 141	73, 272	32, 521	----------	1, 212	----------
Meriden	138, 902	47, 648	----------	84, 248	39, 078	----------
New Haven	1, 033, 700	357, 000	23, 700	242, 700	76, 600	----------
Total	4, 674, 699	1, 552, 092	5, 277, 849	868, 254	346, 019	3, 524, 999
Per cent of each type	13. 2	4. 4	14. 9	2. 4	1. 0	10. 0

State and city	Bitulithic	Cobble	Water-bound macadam	Bituminous macadam	All other	Total
MAINE	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*	*Sq. yds.*
Bangor	----------	27, 554	----------	----------	----------	1, 472, 709
Portland	42, 198	13, 680	326, 630	185, 319	----------	1, 054, 127
NEW HAMPSHIRE						
Manchester	347, 267	----------	594, 950	----------	2, 289, 217	3, 646, 461
VERMONT						
Rutland	9, 853	----------	----------	----------	----------	148, 956
MASSACHUSETTS						
Boston	979, 444	----------	3, 296, 377	2, 332, 658	123, 980	11, 778, 967
Fall River	661, 516	9, 569	----------	269, 303	124, 699	1, 556, 788
Fitchburg	2, 693	6, 918	142, 560	----------	----------	1, 711, 255
Lawrence	71, 818	----------	----------	582, 375	----------	1, 132, 006
Pittsfield	18, 899	----------	----------	----------	----------	832, 661
Worcester	----------	447	----------	----------	----------	682, 428
RHODE ISLAND						
Providence	217, 595	36, 680	2, 066, 548	----------	----------	3, 666, 679
CONNECTICUT						
Bridgeport	1, 650, 000	----------	100, 000	----------	----------	2, 157, 000
Hartford	----------	----------	1, 940, 904	----------	----------	2, 831, 050
Meriden	38, 400	----------	----------	----------	662, 400	1, 010, 676
New Haven	----------	----------	----------	----------	----------	1, 733, 700
Total	4, 039, 683	93, 948	8, 467, 969	3, 369, 655	3, 200, 296	35, 415, 463
Per cent of each type	11. 4	. 3	23. 9	9. 5	9. 0	100. 0

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[1] 897,600 square yards not treated and 336,045 square yards treated.

[2] In bridges only.

In order to show the nature of street construction there is presented also a table of the types and extent of street construction in these cities during the two years 1925 and 1926.

TYPES OF STREET CONSTRUCTION IN 16 NEW ENGLAND CITIES DURING 1925 AND 1926

[In square yards]

State and city	Asphaltic	Cement concrete	Granite block	Wood block	Brick	Gravel
MAINE						
Bangor		89,477	805			
Portland			30,650			11,963
NEW HAMPSHIRE						
Manchester	74,309	10,560	3,705			26,938
VERMONT						
Burlington	52,855					21,601
Rutland	(1)	(1)	(1)	(1)	(1)	(1)
MASSACHUSETTS						
Boston [2]	7,941	3,768	[3] 89,803	729		
Fall River		9,841				
Fitchburg	32,821		20,566			28,613
Lawrence		21.987	7,702			
Pittsfield		32,814				50,000
Worcester	29,042	49,137	12,979			
RHODE ISLAND						
Providence	205,902					
CONNECTICUT						
Bridgeport					500	
Hartford	155,547	12,358	1,199			
Meriden	55,424	920				
New Haven	135,600	10,200	3,200			
Total	749,441	241,062	170,609	729	500	139,115
Per cent of each type	27.9	9.0	6.4	(4)	(4)	5.2

State and city	Bitulithic	Water-bound macadam	Bituminous macadam	All other	Total
MAINE					
Bangor					90,282
Portland			101,143		143,756
NEW HAMPSHIRE					
Manchester				170,321	285,833
VERMONT					
Burlington	8,158			11,813	94,427
Rutland	(1)	(1)	(1)	(1)	(1)
MASSACHUSETTS					
Boston [2]	129,087				231,328
Fall River			89,087		98,928
Fitchburg					82,000
Lawrence	27,128		113,058		169,875
Pittsfield					82,814
Worcester					91,158
RHODE ISLAND					
Providence			273,900		479,802
CONNECTICUT					
Bridgeport	215,000			15,000	230,500
Hartford		123,546			292,650
Meriden					56,344
New Haven				102,900	251,900
Total	379,373	123,546	577,188	300,034	2,681,597
Per cent of each type	14.2	4.6	21.5	11.2	

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[1] None.
[2] Figures for 1926 only.
[3] Some of this work consisted of recut granite block.
[4] Negligible.

The great bulk of the paving reported was naturally in the cities of the southern New England States, where there is a heavy concentration of population.

Considering these 16 cities as a group, it is found that of the total of 35,415.463 square yards of street paving, somewhat less than one-fourth (23.9 per cent) of the yardage at the beginning of 1927 was of water-bound macadam. This percentage is considerably more than that for any other type of paving construction. Granite block paving accounts for about one-seventh (14.9 per cent) and asphalt for a little less (13.2). Bitulithic pavement comprises about one-ninth (11.4), while gravel surface represents 10 per cent. The other types of construction show various smaller percentages.

Very little use has been made of wooden block or brick pavement. The cost of transporting brick from producing centers in Ohio or Pennsylvania and the high expense of construction operate against this form of surfacing. A relatively small percentage of cement-concrete paving is also reported. In this respect the city streets appear similar to the State highways.

Granite block paving makes up an important proportion in some of these cities, and it stands second in the total yardage reported for 1927 by the 16 cities. In Boston, where extensive use has been made of granite block paving, 23.3 per cent of the total city yardage was of this type. A considerable yardage is shown also for Portland and for Lawrence, Fall River, Worcester, and Providence.

The cost of granite block construction has operated severely against its use in many cities. At the present time this type of construction costs about twice as much as asphalt and concrete. A large portion of this cost arises from the preparation of a concrete base. Efforts of block producers have been directed largely to emphasizing the longer period of wear of this type of surfacing, and the possibility of recutting and resetting when the surfacing becomes worn or uneven.

According to granite paving-block manufacturers, the New England cities, as a group, do not afford as good a market as does Greater New York or Philadelphia. It was estimated that in 1926 the purchases of granite paving blocks by Greater New York and its environs were over four times as great as those of all New England cities combined. The city of Philadelphia purchased more than two and one-half times as many paving blocks as all the cities of New England. The making of granite paving blocks is in a sense a joint industry with the making of blocks for building purposes and for cutting into monuments. In a number of quarries all these types of stone are produced, but in others the production of paving blocks and curbing constitutes the entire industry.

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